# 1Rhodora

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### CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CXXXXIX

# ANOTHER CENTURY OF ADDITIONS TO THE FLORA OF VIRGINIA<sup>1</sup>

M. L. FERNALD (Plates 670–695)

PART I. JOURNAL OF FIELD-TRIPS IN 1940

Ambitious to get into the field and glad temporarily to escape being forced to witness the occupation of the lap of spring by the New England winter, I induced Dr. Arthur Stanley Pease to join Mr. Bayard Long and me at our Virginia head-quarters at Century House, south of Petersburg, for our brief spring recess. Although spring had not emerged in eastern Massachusetts, we basked in sunshine in southeastern Virginia, from March 30 to April 4, and tramped through woodlands full of Nemophila microcalyx,<sup>2</sup> gigantic Hepatica americana (DC.)

<sup>&</sup>lt;sup>1</sup> Exploration done with aid from the Penrose Fund of the American Philosophical Society.

<sup>&</sup>lt;sup>2</sup> In this, as in preceding papers of this series, the authors of species are omitted in the narrative if they are in Gray's Manual. The preceding papers on the work in Virginia are as follows: Fernald & Griscom, Three Days of Botanizing in Southeastern Virginia, Rhodora, xxxvii. 129–157 and 167–189, 20 plates (1935)—Contrib. Gray Herb. CVII; Fernald, Midsummer Vascular Plants of Southeastern Virginia, Rhodora, xxxvii. 378–413 and 423–554, 22 plates (1935)—Contrib. Gray Herb. no. CIX; Fernald, Plants from the Outer Coastal Plain of Virginia, Rhodora, xxxviii. 376–404 and 414–452, 13 plates (1936)—Contrib. Gray Herb. no. CXV; Local Plants of the Inner Coastal Plain of Southeastern Virginia, Rhodora, xxxix. 321–366, 379–415, 433–459 and 465–491, 14 plates (1937)—Contrib. Gray Herb. no. CXX; Noteworthy Plants of Southeastern Virginia, Rhodora, xl. 364–424, 434–459 and 467–485, 27 plates (1938)—Contrib. Gray Herb. no. CXXIII; Last Survivors in the Flora of Tidewater Virginia, Rhodora, xli. 465–502, 529–559 and 564–577, with 14 plates (1939)—Contrib. Gray Herb. no. CXXVIII; A Century of Additions to the Flora of Virginia, Rhodora, xlii. 355–416, 419–498 and 503–521, with 24 plates (1940)—Contrib. Gray Herb. no. CXXXIII.

Ker. in three color-forms, Corydalis flavula, which we had not previously seen on the Coastal Plain, Dentaria laciniata (sometimes 18 inches high), and more limited colonies of Obolaria or of Aplectrum, the latter with distinctively veined over-wintering leaves and last year's fruiting stems up to 20 inches high. Little of novelty was seen, though in one piece of new seeding the apetalous Lamium amplexicaule, forma clandestinum (Reichenb.) G. Beck, replaced the common plant with expanded purplish corollas; and one fallow field was given over to masses of Viola arvensis in perplexing color-variations and mingled with Veronica hederaefolia, which we had not previously noted in the state. A new station for Galax aphylla on the Coastal Plain was found and additional ones for Symplocarpus foetidus and for Caltha palustris, each of them indicating areas needing exploration (not yet made) later in the season. Amelanchier was flowering; and one species which we had collected in previous years seemed very marked by its broadly oblong to oblongobovate leaves, corymbiform racemes and erect calyx-lobes. This proves to be A. austromontana Ashe, described from the Carolina mountains and, I believe, not recorded from Virginia.

When we were forced to return to our regular duties at home spring in Virginia was rapidly advancing; but it was more than a month before Long and I could get back to Petersburg for another period of exploration (May 6–12). As on the April trip and for some years past we were happy in securing the assistance of Mr. Leonard Birdsall and his car—happy because we always enjoy Leonard's companionship, sane common sense, good humor and ready helpfulness, and the ability of the car, under his guidance, to go into the most improbable places.

The early species of Carex were maturing and we promptly took under consideration the perplexing plant which we had repeatedly collected, overripe, in June and July, on bottomlands of the Nottoway. Strongly resembling the wide-ranging C. grisea and C. amphibola Steud., this plant of the lower Nottoway has puzzled us since 1936 because its inflated perigynia have a puckered and crumpled summit. In the past we had wondered if it were wholly normal, but now it was superabundant on the rich calcareous bottoms wherever we visited the Nottoway (as Pease has aptly said, it is one of many species of southeastern

Virginia there found "not away from the Nottoway"), its healthy deep green foliage and the inflorescences all vigorous and normal but with the perigynia regularly with the crumpling so long noted in dead-ripe material. Examination shows that, whereas the two closely similar species, C. grisea and C. amphibola, have the prolonged achenes tapering at summit and essentially filling the perigynia, our puzzling plant has them only half as long and with truncate summits. This fundamental character of the achene, which accounts for the extreme puckering of the empty summit of the perigynium, was abundantly checked in much ripe material in June, also in the old collections in the herbarium, and again in June of the current year. The plant is a morphologically quite distinct and undescribed species, to be further considered and illustrated (Plate 671) in Part II. That started the genus Carex with a high initial score; but on four of our trips of 1940 we added 10 other members of the genus (2 never before known from north of Georgia, others unknown from south of northern Maryland and 1 undescribed) to the known flora of Virginia!

While Pease was with us in early April we had, inevitably, taken him to the extensive sandy pine barrens which follow the eastern bank of the Blackwater from below South Quay Bridge into northwestern Gates County, North Carolina. Nothing but Pyxidanthera and Carices were yet flowering there but the splendid association of rare evergreen shrubs is always alluring and there is always the hope of a new discovery. In early April, finding that the bridge at South Quay was being replaced and, consequently, not open to travel, we sought a new and short route back to Franklin, rather than go far out of our way by following the surfaced roads. So we took a dirt road northward from Duck's Store and very soon found ourselves skirting the eastern margin of a fine new tract of white sand and pine barren (characterized by Long-leaf Pine and Catesby's Oak) in Isle of Wight County, south of Lee's Mill and midway between that south of Zuni and the similar but larger area in Nansemond County. In just this chance way we had discovered in 1936 the pine barren between Zuni and Walters; very similarly, we had unexpectedly happened upon the extensive pine barren of western Nansemond; and now we had a third such tract

awaiting exploration—discovered at twilight on our last day of the April trip. Early May was too soon to expect much, but the preliminary canvass showed the typical carpets of *Pyxidanthera* and of *Vaccinium crassifolium* Andr., which meant that day after day until late autumn must be devoted to the new barrens.

In April we had found the rich slopes by the James near Indian Point a carpet of Corydalis flavula and other species of rich woods. So, returning there in May, we were promptly rewarded by a second station in the state for Carex Jamesii and a good colony of C. Leavenworthii, new to Virginia (afterward found along the Appomattox at Petersburg, and under the oaks at Benns Church in Surry County). Ranunculus micranthus was here more than 1½ feet high; Viola striata, at our only Coastal Plain station, was in full bloom; and Myosotis macrosperma Engelm. was unusually tall (up to 23/4 feet high). The latter species (MAP 1) has been very generally misunderstood. It is frequently confounded with merely overgrown M. verna Nutt. (M. virginica sensu recent authors, not as to type, which was a Blue-flowered plant); but the two species have many significant characters, which will be fully presented in Part II. The bottomland swamp, back of the James, at Indian Point is carpeted with Ranunculus carolinianus DC. at its probable northern limit, and Aneilema Keisak Hassk. (discussed by me at length in the last Virginia report) closely mingles with it, while Euphorbia obtusata borders the low woods.

Farther down the James, in Surry County, the northern and upland Carex prasina occurs at two stations some miles apart; the range of Chaerophyllum Tainturieri was extended slightly northward; Conopholis americana was found in such quantity as we had never imagined; and we added Orobanche uniflora to our list of species on the Coastal Plain. In a churchyard at Surry Courthouse Aira praecox, certainly rare in Virginia, was growing; and we were told of yellow lady's-slippers, though we did not see them.

We visited the courthouse-grounds of Prince George Court-

<sup>&</sup>lt;sup>1</sup> Unless otherwise noted the maps in this paper are based on the material in the Gray Herbarium and the Britton Herbarium (New York Botanical Garden), with trustworthy records (as those in Mohr's Plant Life of Alabama) added. Other herbaria would supply more stations, but the general ranges would probably not be materially altered.

house, Surry Courthouse and Isle of Wight Courthouse, all comparatively near the James River, because we hoped there to find Alchemilla microcarpa Boiss. & Reuter and Draba brachycarpa. One or both of these we had found in the lawns and open ground by the courthouses of Greensville and Southampton Counties and we had jumped to the alluring conclusion that they were being spread by the foot-wear of the officers of the circuit courts. When we explained our hope to court-officers at Isle of Wight Courthouse, they promptly said: "It's no use; we James River counties are on a different circuit". They were right; the Draba and Alchemilla are not there. We could establish no evidence that the court-officers of the more northern counties had been "bootlegging" weeds from the lawns of the more southern judicial circuit.

The region of Carey Bridge (over the Nottoway) and of Applewhite's Church, in Southampton County, had proved worth while in 1938 and 1939, with an abundance of highly localized and interesting species found there: Tetragonotheca helianthoides, Sida inflexa Fernald, Polygala polygama, etc. We, consequently, make a point of checking the area as often as possible for something previously overlooked. The brief visit there on May 7th gave us typical Amsonia Tabernaemontana (recorded by me a year ago) and a colony, on the wooded bank of Three Creek, of typical Viola septemloba LeConte, also not previously known from Virginia, although it will not be surprising if critical study reduces to it some of the more recently proposed northern species. Near by, on the wooded slope by Three Creek, north of Applewhite's Church, a rather definite new Carex was discovered, evidently allied to C. digitalis but with peculiarly inequilateral and arching fruits, an undescribed plant, although already represented in the Gray Herbarium from eastern Georgia and northwestern Florida.

At another area on Three Creek, just at the "fall-line" north-west of Emporia, the rich woods were more those of the Appalachian Upland than of the Coastal Plain. We already knew this transition-spot with its upland vegetation of Scleria oligan-tha, Chamaelirium luteum, Stellaria pubera, Silene virginica, Clematis ochroleuca, Sanicula Smallii, Coreopsis auriculata and other Alleghenian species; but we were not prepared to find

close to the Coastal Plain Ligusticum canadense, Thaspium trifoliatum (L.) Gray, var. flavum Blake, the upland yellowflowered representative of the smaller purplish-flowered Coastal Plain T. trifoliatum, and, closely simulating it, the upland and transcontinental Zizia aptera (Gray) Fernald (Z. cordata sensu most authors, not Smyrnium cordatum Walt., its basinym). Migration only a few rods down the valley would bring all three definitely into the Coastal Plain. In fact, one of them was found, in June, well to the east of this rock-ribbed boundary. Along a path in these woods, some miles from the nearest town and with only a small clearing (quite innocent of the plant) near-by, was a fine colony of the handsome Vicia grandiflora Scopoli, a European species with flowers up to 1½ inches long, the yellowish corolla suffused with lilac or black dots. Dr. Robert Tatnall had been getting it on the Eastern Shore; but how it got isolated in this remote spot is a problem, a problem the more complicated because in August two other equally isolated new arrivals were found in profusion at the border of these woods. At another point just above the "fall-line", this time on the Appomattox slightly above Petersburg, we got many species from the rich woods which we know definitely to creep over to the Coastal Plain; but there were two, Amsonia Tabernaemontana, var. salicifolia (Pursh) Woodson, and Scutellaria nervosa, which we still yearn to see native slightly farther east.

So much for the rich woods. A brief visit to the sandy pinelands near Cathole Landing, on Somerton Creek west of Factory Hill, gave us good returns. The plants most worth special record are two. Sphenopholis filiformis (Chapman) Scribner, the most delicate member of the genus, a species not recorded from north of the Carolinas and Tennessee, has a nice station on one sandy ridge south of Tom Hunter's. Along the branch which empties into Somerton Creek we were made very uncomfortable by a tall (up to 10 feet high) sprangling bramble. Since it differed from any we had previously encountered we painfully and dutifully took three sheets. It is fortunate that we thus salved our consciences, for the flowering material is a close match for the type of Rubus floridus Trattinick, a longlost species, described in 1823 from material sent to Vienna by Enslen from somewhere in the South, and, according to Bailey, it has never been rediscovered. It is unfortunate that we did not know its full interest when we found the colony, for we should then have overlooked the pain and taken abundant material. Still more unfortunately, when we returned to the station in June of this year, the effects were everywhere evident (dried-out and dead leading shoots and blighted fruits) of a late spring frost which had hit the region and had caught practically all the floricanes of R. floridus. Again, three poor fruiting bits were all we got. The station is easily reached, however, and another year should yield plenty of good material. On the way there, if the searcher takes the proper sandy side-road¹ southwest of Marsh Hill School, he can see a considerable colony of Rhododendron atlanticum (Ashe) Rehder, with the corollas cleft to base into slenderly linear to filiform segments, a most bizarre form (Plate 692) when in full bloom.

The inundated woods, swamps, thickets and clearings centering on Stony Creek in Sussex County always yield good things. The swamps (with back-flow from the Nottoway) are so extensive, from north and west of the town to some miles to the south and east, and their proper exploration physically so exhausting that we have never made a thorough examination of them; but whenever we stop in passing we are always repaid. Halting on this trip to look into a damp fallow field full of Alopecurus carolinianus Walt., Agrostis Elliottiana, Poa Chapmaniana, Sibara virginica (L.) Rollins, Callitriche deflexa var. Austini, and other vernal and quickly passing species, we chanced to wander across the road to the uncleared and deeply drowned margin of the woods. There, covering a good portion of an acre and only a few rods from a spot we had previously investigated, was a solid colony of the northern and transcontinental ("New Brunswick to British Columbia, and southward to Tennessee . . . New Mexico and southern California"-Mackenzie) Carex lanuginosa, new to the known flora of Virginia and surely not to have been expected among such austral associates. This addition to the flora must finish the records for May, except that, in wet woods along a small branch north-

When we first encountered this particular road, with its water-holes, asymmetrical ruts and floating corduroys, Leonard sought out a farmer in a distant field, to ask about driving over it. Returning to the car he reported: "He says 'the road's not bad if you knows how to drive over it!" Leonard knew how.

east of Sebrell in Southampton County, we came upon a few plants of very erect and wholly typical Dryopteris cristata (L.) Gray, another northern and transcontinental (even circumboreal) species, which seemed as much out of place on the Coastal Plain near the Carolina line as does Carex lanuginosa, or as do such other boreal species of the general region as C. Buxbaumii Wahlenb. ("Newfoundland to southern Alaska", etc.), Caltha palustris or Drosera rotundifolia. This localized station for Dryopteris cristata is on land which, at the opening of the 19th century, was part of the vast domain of Edwin Gray, the host of Frederick Pursh, who in this region established northern limits for many extremely southern species: Asimina parviflora (Michx.) Dunal, Quercus laevis Walt., Lobelia glandulifera (Gray) Small, Carphephorus bellidifolius (Michx.) T. & G. and, best of all, Litsea geniculata, which is characterized by Small (under Glabraria geniculata) as "One of our rarer shrubs... Its closest relatives . . . tropical".

In June (4-14) I was met at an early afternoon train by Long, with a bunch of Bromus catharticus in his hand, and Leonard; and, since it was not worth while to go far afield, we returned after lunch to the wooded banks of the Appomattox below the Norfolk and Western station in Petersburg. We knew from a visit the preceding autumn that there were rich alluvial woods in which travel was made difficult by tangles of Clematis Viorna and by shoulder-high thickets of Laportea canadensis. We were, therefore, not surprised by the abundance of Staphylea and other calcicoles. We were not prepared, however, to see in southeastern Virginia so distinct a species as Carex conjuncta ("New York . . . to the District of Columbia, and westward to South Dakota and eastern Kansas"—Mackenzie) making solid stands. Mackenzie says "4-8 dm. high" but on the Appomattox it vies with Laportea and reaches a height of 10.5 dm. (3 feet, 6½ inches). It is here very abundant and handsome and two days later we were collecting it on the north bank of the James. It is another indication of the lack of general interest in the more technical groups that so conspicuous a species should be "new to Virginia". On the upper banks of the river, partly in natural habitat, partly in railroad cinders, so that

<sup>&</sup>lt;sup>1</sup> See Rhodora, xlii. 362 (1940).

their status as natives is questionable, Carex Leavenworthii was growing; and Rubus trivialis, at its northwestern outpost in the state, and R. centralis Bailey, extended south from Stafford County, entangled their creeping stems.

Farther out, definitely on cinders of the railroad yards (of the Atlantic Coast Line and the Norfolk and Western) there is no question that most of the plants are adventive, though some are evidently natives resisting invasion. Bromus catharticus abounds, B. sterilis has a foothold, and Festuca octoflora is bafflingly variable. Typical Sphenopholis obtusata (with glabrous sheaths) is there but probably adventive, since the common native of southeastern Virginia is var. pubescens. Rumex altissimus has crept south from the region of Washington and Chaerophyllum Tainturieri, var. floridanum northward from South Carolina; and Anthriscus scandicina (Web.) Mansfeld (A. vulgaris Fries), a new wanderer from Europe, has come to stay. Most of these plants, except the last, with the turpentinelike oil of which I unsuccessfully tried to make Long flavor his tea, would scarcely excite the enthusiasm of those whose "botany" begins and ends with showy flowers; but the beautiful colony of Heliotropium europaeum, with cymes of rich purple flowers, would win their applause, assuming that its great beauty compensates for its lack of the expected fragrance.

On the 5th we went south to the Nottoway, to secure ripe material of the two new Carices and to pick up any novelties occurring with them. When we parked the car on the soft shoulder by the river west of Homeville, where calcareous bottomland soil had been used for the shoulder, the effect of thus loosening it was at once apparent in the gigantism of the plants invading it. This stimulation to growth was well displayed by Plantago virginica with spikes nearly a foot long. Ordinarily spikes half that length are considered near the maximum size. The two new Carices were both in good ripe condition, settling their achene-characters; but our attention soon turned to another plant which, since we first saw it along the Blackwater in 1936, has been puzzling us. We, of course, were very familiar with Justicia americana (L.) Vahl (Dianthera), which carpets much of the lower James, and we had become familiar with the very different and exclusively southern J. humilis Michx.

(Dianthera ovata) in Southampton and Nansemond Counties. The plant which troubled us is midway between those two species in habit and inflorescence and it inhabits deeply shaded bottomlands and margins of quiet and shaded waters from south of the James to the Carolina line. We were still worried by it but, actually, it was in June of the current year before we brought together side-by-side fresh flowers of the three. Although this final study belongs more explicitly to a report on the work of 1941, it has so long been in progress that I am including in Part II an account of the new species with illustrations (PLATE 693) of the very different corollas, stamens and seeds of the three.

On the bottomland just east of Carey Bridge Long collected the prize specimens of Mitchella repens—with corollas three fourths of an inch long. In fact, much of the Mitchella in this quarter of Virginia has the flowers larger than we are used to farther north but I have been unable to find any definite morphological character to separate the two, although in March Pease had specially commented that the plant in Southampton "looked" unlike that of New England. The genus was named for John Mitchell, who lived near the mouth of the Rappahannock and in 1748 published a small tract on the plants of Virginia. It cannot now be settled (Mitchell's plants, presumably in England, being inaccessible until after the war) what form he had. In a small cypress swamp on the eastern bottomland of the Nottoway at Carey Bridge there is a beautiful Carex of § Ovales. It certainly "looked different" and its very large and cordate or round-based perigynia show it to be C. reniformis (Bailey) Small (MAP 2), a very rare species of the region from Florida to Texas, north, very locally, into eastern Georgia, northern Mississippi and eastern Oklahoma; and now in Southampton County, Virginia. Directly across the river, at a springhead in the wooded bank, we soon discovered the first definite station known for the famously rare true Sphenopholis pallens (not S. pallens of most authors which is the transcontinental S. intermedia Rydb.), which was described 134 years ago from material of indefinite origin sent by Muhlenberg to Sprengel and has subsequently been known only from a second collection

<sup>&</sup>lt;sup>1</sup> See Rhodora, xlii. 356, 357 (1940).

made somewhere in South Carolina. Since Elliott and Muhlenberg freely exchanged material and Elliott's herbarium contains much from Muhlenberg and Muhlenberg's much from Elliott, it is not improbable that the original material sent by Muhlenberg to Sprengel came, not from Pennsylvania as assumed, but was originally received by the sender through Elliott. At any rate, Carey Bridge and the Nottoway still retain their prestige!

The next day, June 6th, we swung northward. In early April we had found along the James, slightly west of Varina, a particularly rich slope and wooded bottomland, and northeast of there, at our old springy and boggy area west of Elko Station, there was an immature *Tradescantia* which we wished to check. On the way, in passing through the eastern border of Richmond, near the limit of tide on the James, we saw that *Zizaniopsis*, characteristic of tidal shores, had extended as far as possible up-river; and with it was a white-flowered *Convolvulus* which could be only *C. sepium*, var. *fraterniflorus*, of "The Prairie and Great Plain region", "Illinois to Montana, south to Arkansas and New Mexico"—Tryon in Rhodora, xli. 422 (1939). We are beginning to be hardened to such ranges!

The slopes and bottomlands west of Varina were as productive as we had anticipated, with lush growth of calcicolous species. Here, again, was Carex conjuncta, with the northern and inland C. normalis Mackenzie and C. tenera Dewey, the latter new to Virginia. Xanthorhiza simplicissima Marsh. (X. apiifolia) greatly surprised us, for we thought of it as an upland plant, though a few days later we were getting it in Southampton County and, still more surprising and to make a thorough job, finally in Nansemond County at the border of pine barren!

The greatest "jolt" at Varina, however, was when we found side-by-side two quite distinct members of the genus *Heuchera*, one of them a coarse plant with deeply cordate and heavy foliage which required two weeks in press properly to dry; the other smaller, with the thin leaves subtruncate at base and coming out of press in three days. The monographers of the genus, evidently without looking up all the specimens cited by Linnaeus, have selected to stand as typical *Heuchera americana* L. (the only Linnean species and, therefore, the type of the genus) a form which they surmise to be typical: "Since it is

the only form of Heuchera americana that occurs in tidewater Virginia, whence apparently, came the plants seen by Linnaeus, it appears that this variety rather than the more widespread Northern and Western one next discussed must be taken as the type of his species. This conclusion is borne out by the fact that this is still the form cultivated in European botanical gardens under the name of H. americana". But here, growing together, were two members of the group; while the plant treated by Rosendahl, Butters & Lakela as true H. americana is relatively frequent (at several stations) in tidewater as well as upland Virginia and at two points in tidewater Virginia we collected "the more widespread Northern and Western one" which the monographers felt could not be typical of the species because they had not seen it from tidewater Virginia. Further to complicate the matter, in June, 1941, we have been collecting from extensive colonies on the lower James (within the maildelivery area of Smithfield) gigantic plants with panicles nearly a foot and a half long and up to 6 inches broad, leaves heavily soft-pilose, and scapes almost as shaggy as in the most extreme plant of the Ozarks. This and some of the others are in areas where they could scarcely have been missed by early collectors; and it is quite certain that no one of the five can be singled out as type of the genus Heuchera and of H. americana simply because "it is the only form . . . that occurs in tidewater Virginia". At the present rate of discovery we can hardly feel certain that we have reached the end; and until the specimens cited by Linnaeus are critically studied it cannot be determined just what is the type.

The genus *Heuchera* started in 1737 almost simultaneously in Linnaeus, Genera Plantarum, ed. 1: 68, where it was described without statement of source or of origin of name, but with a single reference to Boerhaave, and in Linnaeus's Hortus Cliffortianus, 82 (1737), where earlier references (to Hermann, Plukenet and Boerhaave) were cited and the plant said to "Crescit in America", the genus named for Johann Heucher of Wittenberg. To me the plant of Hortus Cliffortianus, of which a good photograph is before me, seems to be the type. It was the plant actually known to Linnaeus and clearly bears his inscription

<sup>&</sup>lt;sup>1</sup> Rosendahl, Butters and Lakela, Mon. Gen. Heuchera, 56 (1936).

"americana"; while the evidence is that he had nothing in his personal herbarium in 1753 (starting point of specific nomenclature) so identified. But Linnaeus cited plants of Clayton and others. These (all in Europe) can not just now be identified. It is fairly clear, however, that Hermann's plant of Cortusa americana, a name still earlier cited by Boerhaave and later cited as a synonym by Linnaeus, and from which, it is possible to argue, Linnaeus might have borrowed his specific name, is characteristic H. villosa Michx. Hermann's plate is to me of unmistakable H. villosa and the old descriptions defined the "flore squalide purpureo villoso". As yet H. villosa is not known from east of the Appalachian Upland but that should not be disconcerting, for many plants (including some from Clayton<sup>1</sup>) very early reached Europe from the mountains of Virginia. Rosendahl, Butters & Lakela separate their § Villosae from their § Americanae by "Outside of the flower villous" in the former, contrasted with "Outside of the flower glandularpuberulent without any villous hairs" in the latter. With the earliest pre-Linnean accounts of Cortusa americana, or of Mitella americana of Boerhaave, calling for villous flowers, with Hermann's plate showing characteristic H. villosa, with Linnaeus's own material of Hortus Cliffortianus a quite different plant, with four or five different plants now known in tidewater Virginia and the likelihood of others being there found, it is certainly wiser (and easier) to defer the answer. This situation, however, vividly illustrates the complexity of the flora of southeastern Virginia and the errors which may result from an assumption that it is sufficiently known.

The *Tradescantia*, forming a large colony west of Elko Station, proved, appropriately enough, to be *T. virginiana*, although Anderson & Woodson in their monograph of the genus cite no material from the Coastal Plain of Virginia. Near it, while we were inspecting our small colony of *Helonias bullata*, we suddenly remembered that *Carex canescens* var. *disjuncta*, which was abundant in the bog, had not been seen by me, when I described

<sup>&</sup>quot;John Clayton (1693-1773) . . . collected plants extensively in eastern Virginia, and was also much interested in the plant life of the interior. He seems to have traveled into the interior to some extent. . . . He also encouraged travelers to bring plants from the western sections. We find in some of his letters mention of plants from as far west as Wythe County [in the Alleghenies]"—A. B. Massey, Plant Hunters in Virginia, The Commonwealth (Richmond, Va.) vi. no. 4: 14 (April, 1939).

the variety, from south of Maryland. It was, therefore, worth collecting, although over-ripe. We had heretofore regarded Lapsana communis as relatively rare; but the embankments of the Chesapeake and Ohio, west of Elko, are covered by a low thicket of it and since we had seen it near the same railroad in Richmond, 18 miles to the west, it has evidently got a real foothold. The only other plant worthy a note here is the infrequent Galium parisiense, which forms a thin carpet in the cinders near Elko station.

It is unnecessary that the remaining notes on the June work should be strictly chronological. The thought having gradually but very forcefully evolved, that in southeastern Virginia many of the most interesting plants are "not away from the Nottoway", we finally conceived a rapid capture of them all by what is now known as a Blitzkrieg. Study of the contour-sheets showed that, beginning with Double Bridge, where the Nottoway enters the Coastal Plain, thence swinging eastward, then northward, and finally southward, uniting with the Blackwater at the North Carolina line, there are at least 16 bridges across the river in the Coastal Plain. There are also various railroadbridges and old ferry- and boat-landings, as well as other old but perhaps passable routes to the river. Our work was cut out but, as yet, we have "contacted" the river at only a few points; these have usually proved worth while. The Nottoway rarely "lets us down". Starting south of Littleton on a sandy sideroad, to reach the river at Peters Bridge, we were soon startled by the vivid show of orange-yellow which could not come from any of the endless color-forms of Butterfly-weed, Asclepias tuberosa. Leonard slowed down in the deep and slewy sand and we made a first-hand acquaintance with the splendid southern Lithospermum carolinense (Walt.) MacM., heretofore known from Florida to Texas and Mexico, north to Arkansas and Oklahoma, and in the East to sand-hills of South Carolina. All about Chub, for at least two miles north and south, the dry white sand of open woods and clearings is brilliant in June and early July with the gorgeous inflorescences. The usual "sandhill" plants of the South are there and new northern limits for several of them, Quercus cinerea, Stillingia sylvatica, etc., were

established. That was a good start and it was evident that our new plan of campaign was going to work.

The wooded bottomland between Chub and Peters Bridge jarticularly rich and most species of such woodlands reach phenomenal development, while Asclepias purpurascens, which we once thought to be rare on the Coastal Plain, is very handsome and abundant. At the crest of the bank immediately above the river, however, we got our two prizes, two montane species new to the Coastal Plain: Tradescantia canaliculata Raf., which Anderson & Woodson in their monograph of the genus map for Virginia only from west of the Blue Ridge; and Stenanthium gramineum, another characteristic plant of the mountain region.

Another day we visited two other bridges over the Nottoway. One, Double Bridge, we well knew, but we thought that by approaching it from down-river, instead of from the Piedmont, we might pick up some novelties. Somewhat north of Orion (pronounced  $\check{or}$ -i- $\check{on}$ ) we were attracted by rich woods sloping to the river and there, among other good things, we found the characteristically broad-triangular and abruptly almost cuspidate-acuminate, glabrous foliage which very closely matches the type of Viola latiuscula, hitherto known only from calcareous western New England, eastern New York and northwestern New Jersey. It was accompanied by the beautifully distinct and rather ornamental southern Carex oxylepis and by the Heuchera, already referred to, which had been supposed not to occur in tidewater Virginia, the plant treated by Rosendahl, Butters and Lakela as H. americana, var. brevipetala. Here, also, was unmistakable Zizia aptera, the upland and nearly transcontinental species which had so surprised us when we found it at the "fallline" northwest of Emporia. In the woods north of Orion it is well below that boundary-line. Best of all, along the little brook in these woods were carpets of young stalks of the weakstemmed Aconitum which we already know at Carey Bridge. When we finally get it in flower and fruit, if we ever do, it will presumably prove to be the montane A. uncinatum. The colony at Carey Bridge was under 40 feet of water during the terrible freshet of the following August; that near Orion barely escaped, but in early September the trailing and leaning stems

scarcely showed any indication of flowering. In October, if freshets or drouth do not spoil it, we are hoping for conclusive material of the plant. The flowering material in the Gray Herbarium of A. uncinatum was collected from August 9 to October 10.

North and northwest of Jarratt the boundary between Sussex and Greensville Counties follows the sinuosities of the Nottoway and the bridge next below Double Bridge is called, on the contour-sheets, Readjuster Bridge, although, when in Jarratt we asked how to reach it, our informant looked puzzled by the big word but admitted that by following dirt roads as sinuous as the river we should come to a bridge. The southern end of the bridge is at the northeastern sharp angle of Greensville County, about due north of Orion, the northern end in the reentrant western angle of Sussex, just south of what seemed like an unromantic small village with an unromantic name, Peanut. The road from Jarratt finally straightens out and proceeds for a mile or two through swampy woods and argillaceous clearings, sometimes very wet but after drouth with an almost impervious baked-clay soil. In these clearings there is a rank growth of many species and we collected many of them to establish records for size (Panicum polyanthes, for instance, with leaves more than an inch and a quarter broad), others for county records (Juncus diffusissimus, for example, our first from Greensville County); but the most important plant, perhaps, was typical Hypericum denticulatum Walt. We already knew var. ovalifolium (Britton) Blake from three counties farther east, but the typical variety of the species seems to be new to Virginia.

When we reached the Sussex end of the bridge (south of Peanut) I turned south on the wooded bottomland, Long north. My attention was promptly drawn to a perplexing swale of sedges, but before I could concentrate on it a call for help came from above the bridge. Hurrying to Long's aid I found that all he wanted was botanical, not physical, support. He was legitimately puzzled by the flowering and fruiting aquatic in a backwater pool by the river, which failed to register. I, too, was puzzled by it, until I remembered *Peplis diandra* Nutt., chiefly of the Mississippi drainage (MAP 3), the plant which has been unjustifiably separated from *Peplis* as *Didiplis diandra*. Our

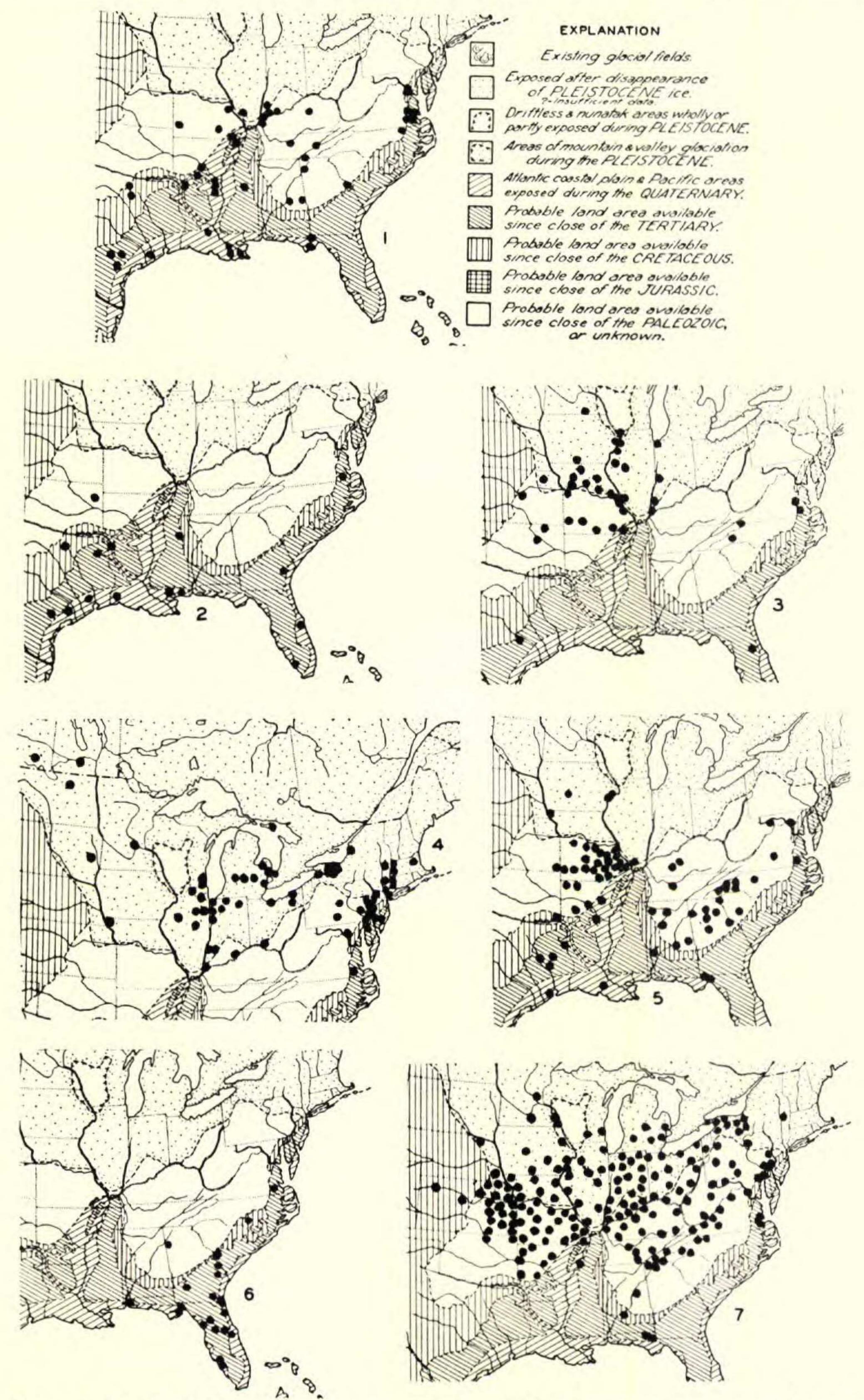
plant was certainly Didiplis or Peplis, but it is very rare in the East. The only stations I have located east of western Indiana and eastern Missouri are two in the upland of North Carolina, our new one, one at the "fall-line" in Chesterfield County, Virginia<sup>1</sup> and, far remote from the others, one in Florida. Just as remote is a Texan station. It is humiliating to record that Long and I, making an off-hand misidentification, had collected remarkably large terrestrial plants of the Peplis in Chesterfield County and that the many duplicates were distributed by me and recorded in Rhodora, xli. 477 and 570 (1939), as the habitally similar Oldenlandia Boscii (DC.) Chapm.<sup>2</sup> After we together took the necessary two dips to secure the best material of Didiplis we returned to my original problem. The dominant Carex which had astounded me was C. tetanica (MAP 4), a northern calcicolous species, occurring from New England to Saskatchewan, with its previous southeastern limit in the upland of Maryland. While we were absorbed with C. tetanica and an obvious hybrid of C. lurida and C. squarrosa, Leonard remarked "I never saw a clover like this". Neither had we. In openings in the thicket and in the border of the woods he had discovered a good colony of Buffalo Clover, Trifolium reflexum (MAP 5), the true southern and pilose T. reflexum, not the more northern and glabrous var. glabrum Lojacono in Nuov. Giorn. Bot. Ital. xv. 150 (1883). The latter extends north into central and western New York and southern Ontario. Only typical pubescent T. reflexum is included on the map. Torrey & Gray (1838) and others have given the northeastern limit of typical T. reflexum as in North Carolina; and Small, in his Manual, says: "northward only W of Blue Ridge, Fla. to Tex." etc. Professor Wherry, who intimately knows western Virginia, tells me that he has never met the plant there; and the only station in the state known to Professor Massey is one discovered in May, 1940, by Mr. E. W. Carson in Cumberland County. The old stations, where last collected in 1902, along the Potomac, kindly enumerated for me by Mr. E. H. Walker of the National Herbarium, seem to have been in Maryland. Mr. Walker states

<sup>&</sup>lt;sup>1</sup> Too late for inclusion on the map other stations in eastern Virginia, as far north as the Chickahominy River.

<sup>&</sup>lt;sup>2</sup> Those who received no. 9439 are asked to correct the identification to Peplis diandra Nutt.

that otherwise the National Herbarium shows nothing from north of North Carolina. Nevertheless, T. reflexum was originally published by Linnaeus (1753) with "Habitat in Virginia". He then cited an earlier description of a Virginian plant described by Plukenet (presumably received from Banister) and specimens collected by Clayton and described by Gronovius. Presumably the species, which naturally occurs in openings in loamy or otherwise rich thickets and woods, agriculturally promising habitats, was once more generally distributed in the state. At any rate, we now know a good station at the edge of the wooded bottomland of the Nottoway only a few rods from a still more isolated colony of Peplis diandra. In spite of a modern invidious connotation of the word peanut (as in "peanut politics"), no true botanist will jeer at Peanut, Sussex County, Virginia. That humble locality now has a dignified place on the botanical map of the state, and the Nottoway there maintains the interest we expect of it.

We had not wholly forgotten the pine barrens of western Nansemond and adjacent southwestern Isle of Wight. In the latter area we added Amianthium Muscaetoxicum and Polygonella articulata to the county list; and in the former we found a new station for Calopogon pallidus Chapm., some miles away from our first station, and with it young shoots of unmistakable Gentiana Stoneana Fernald. Our greatest delight, however, was in finding in full flower extensive thickets of the rare and distinguished Zenobia pulverulenta (Bartram) Pollard, discussed by me in detail in Rhodora, xlii. 471-473 (1940). All three forms (sometimes treated as species) grow together, very striking in their extremes, and the beautiful broad white bell-shaped flowers are deliciously fragrant. Most unhappily they lose their fragrance and become discouragingly blackened in drying. Calopogon pulchellus, in all color-shades from bluish-purple to pale pink, abounded and the white-flowered plant, forma albiflorus (Britton) Fernald, was positively abundant on one area—many scores of plants. Tom Hunter had invaded the springy sphagnous bog with his plow; and in his corn-field, heavily manured and fed with commercial fertilizer, the Calopogon lingered along the rows. It was a novel experience to collect this bog orchid as a "weed" in a cultivated field. It is supposed to be in-



Map 1, range of Myosotis macrosperma; 2, Carex reniformis; 3, Peplis diandra; 4, Carex tetanica; 5, Trifolium reflexum (typical); 6, Psoralea canescens; 7, Campanula americana.

tolerant of lime; but the manure and the nitrates in the fertilizer seemed to have stimulated it and the calcium not to have injured it. From one hill of corn I extracted a plant three feet high, with leaf 7 inches long and 1½ inches broad, flowers approaching 2 inches in breadth, 21 of them in a full raceme more than a foot long. Calopogon may yet become a garden plant!

The Peninsula of Virginia always yields good returns; so, on June 12th we made a brief circuit into York County. Near Grafton there is a swale bordering swampy woods which at once attracted us by its display of Asclepias purpurascens. Upon investigation the swale proved trebly interesting, for it is given over largely (for an acre or more) to the southern Lythrum lanceolatum Ell., a species we had known as far north as Virginia only from a little remnant of swale near Homeville (Florida to Texas, north to southeastern Virginia and Arkansas). With it was Scirpus lineatus, an inland and relatively northern type, which we had never seen in southeastern Virginia, although Grimes got it near Williamsburg. As we approached Yorktown, fields and clearings began to be showy with the dark purple globular umbels of a gigantic onion (more than a yard high, with very dense umbels more than 2½ inches in diameter); and some miles farther on, up-river from Yorktown, areas along the newly disturbed lands of the parkway are rapidly being invaded by it. It is superb to look at, but its deep-seated large bulbs, each producing a hundred or more small bulblets, make it a serious threat to hay-fields and pastures. It is far more vigorous and effective in rapid propagation than the pestiferous Field Garlic, Allium vineale, which, for two centuries, has occupied and tainted the fields of the Coastal Plain. Unless drastic steps are immediately taken to exterminate it (already a difficult task) before it goes any farther, eastern Virginia and adjacent states will be overrun by a new and highly flavored pest. It is a plant originating in the warmer parts of Europe and western Asia, Allium Ampeloprasum L., var. atroviolaceum (Boiss.) Regel. A. Ampeloprasum has a number of varieties, this one with a dense ring of essentially sessile bulblets borne about the base of the parentbulb. For purely whimsical reasons we should have been glad to add to the Virginia list the oriental variety with the small

bulblets borne on long stalks, like a loose crown, about the parent-bulb, var. pater-familias. The name alone makes it sound "interesting but tough".

Other weeds have become established above Yorktown, some of them likely to spread, as they have done farther north. Silene Cucubalus Wibel (S. latifolia), a ubiquitous weed of fields and roadsides in eastern Canada and the northeastern states, is rapidly increasing along the parkway. It is a relatively harmless weed, however, and from its young and tender new leafy shoots in early spring a good purée, suggestive of pea-soup, may be prepared. It would be well, however, that the plant have an English name different from the long established Bladder-Campion. In the thicket slightly above Yorktown Verbascum Lychnitis abounds, a European species not very generally established in America; and on the sands along the river and farther west along the parkway a small Old World Medicago, with burr-like fruits, M. minima L., var. compacta Neyraut, has taken a firm hold. I have emphasized the weeds of disturbed soils, but the native flora in undisturbed areas is always interesting along the lower York. Acer floridanum Pax, apparently not previously recorded from the county, thrives and is made conspicuous by its chalky-white trunks; and under it in early spring a rich vegetation of early-flowering herbs may be expected. Arabis laevigata, growing there, is a good indicator.

Only one more plant need here be recorded for the June trip. This is the very low and stoloniferous, colonial and small-leaved Amelanchier which abounds in pinelands and other acid soils. Strongly suggestive of the northern A. stolonifera Wiegand, it is markedly different from that species in its very thin and relatively narrow leaves, with uniformly small teeth and compact flowering racemes, with very short pedicels. It was now fruiting; the rather dry fruits are also short-pedicelled and with erect calyx-lobes. It is a strongly marked species of the southern Coastal Plain, not heretofore generally understood, although André Michaux, a century and a half ago, had a good knowledge of it. It will be further discussed and illustrated in Part II.

Late March and early April had been relatively unproduc-

tive of novelties, May had done better by us, and June had given splendid returns; but by July our restricted time prevented our reaching half the areas we wanted to examine, while in late August and early September novelties and new problems were so frequent that it was difficult to convince ourselves that, for seven seasons we had been working in the field at intervals on the flora of southeastern Virginia, five seasons with our routes radiating from the same center, Petersburg. When we reached Petersburg for our July work (July 9-19) we were grieved to learn that Leonard could no longer help us. He had, however, done the best thing possible for us, delegated his position to his brother, Frank Birdsall, a graduate of William and Mary and now at the head of the large Seaboard High School in northern North Carolina (over the line from Emporia). Frank promptly adapted himself to the new work, drove skillfully and with Leonard's ability and willingness to tackle difficult roads, and was a genial and always interesting and interested companion; we felt ourselves very fortunate. Our first venture, obviously, was to the dry sandy woods at Chub, where Lithospermum carolinense has its only known station north of the sand-hills of South Carolina. Here the southern Bulbostylis ciliatifolius (Ell.) Fernald was found at a new northern limit and other "sand-hill" types, rare so far north, were collected. For years we had been searching for Baptisia villosa, collected nearly a century and a half ago by Frederick Pursh in Southampton and much later by Canby in the same county. Consequently, when, at the border of the woods, I stumbled upon a strange erect leguminous plant passing out of flower, I thought that we had at last located it. But a little examination showed that I was wrong. The disappoinment was more than cancelled, however, for we were collecting Psoralea canescens Michx., a yellowish-flowered species of sand-hill and sandy pinelands of Florida, Georgia and Alabama, heretofore unknown north of southern North Carolina (MAP 6). It is certainly an appropriate companion for Lithospermum carolinense; but another occupant of the same woods, in the largest colony I had ever seen (I cannot speak for Long), was a wholly inappropriate companion for those two-Scrophularia lanceolata Pursh, hundreds and hundreds of plants, a species occurring, accord-

ing to Pennell, from "Cape Breton Island to British Columbia, south to [mountains of] Virginia", etc. Here at its southeastern limit of range, it is in sandy oak and hickory woods where in August we found typical Sanicula marilandica (northern Newfoundland to Hudson Bay and British Columbia, south to Nova Scotia, New England, Virginia, upland to northwestern Florida, Great Lakes states, northern Kansas and Colorado) growing with the largest colony we ever saw of Hexalectris spicata (Mexico to Florida, north to Maryland, Virginia, etc.) and with other species hitherto "unknown from north of South Carolina"; and close at hand, in more sterile areas, other such meetings of North and South were noted. Another such amazing juxtaposition was found when we went down the slope south of Chub to the sphagnum-carpeted spring-heads bordering the bottomland-woods of the Nottoway. We went for a drink of cold spring-water, but in getting at it we were forced to push back the fruiting branches of Rhododendron serrulatum (Small) Millais of "Ga. to Fla. and La." (Rehder, Man. Cult. Trees and Shrubs, ed. 2). We then crouched, to get our drinks, in a carpet of Campanula aparinoides, the first colony we had ever met in Virginia of this northern and upland flaccid plant (Maine to Wisconsin, Nebraska and Colorado, south to upland of Georgia, etc.). What would those who are "sold" on the exact working of life-zones in mesophytic lowland eastern America do with these plants? Their behavior is as reprehensible as the commingling in Newfoundland of Schizaea pusilla with Sparganium hyperboreum, or the interlocking in western Nova Scotia of Ilex glabra and Ledum groenlandicum, or the climbing of Picea mariana there by Smilax rotundifolia!

Across the Nottoway, south of Peters Bridge, there is such a domination of the sandy woods by Quercus cinerea and its almost endless variations and apparent hybrids that we got the impression that this is one of the most unstable of species. The hybrid,  $\times$  Q. subintegra Trelease (Q. cinerea  $\times$  falcata) is there in quantity. Just below the bridge, in the sandy loam of the woods above the Nottoway, the Coastal Plain Thaspium trifoliatum abounds and with it the northern and inland Scutellaria parvula, var. ambigua, a rare plant in Virginia. Still farther south of Peters Bridge and over the line in Southampton County,

in the thickets and woods near Raccoon Creek, we came upon our second Coastal Plain colony of the upland Xanthorhiza; and not far away the upland Pycnanthemum Torrei abounded. North of Peters Bridge, near Lumberton, lies Chappell's Millpond (now known as Honey Pond). The margin of the pond is an aquatic garden, with Echinodorus radicans, Brasenia Schreberi, Potamogeton capillaceus Poir. and other species already familiar; but we were more interested in the southern extension of Potamogeton Berchtoldi Fieber, var. tenuissimus (Mert. & Koch) Fernald, new to Virginia, and, also in the same category, Ceratophyllum echinatum Gray. We strained our backs, legs and eyes, bending over and carefully fingering, under water, thousands of plumes of the Ceratophyllum in a vain search for fruit. Fortunately, as pointed out in Part II, fruit is not absolutely necessary for identification of it.

With Potamogeton in mind, we remembered a slow creek at the outlet of Lee's Millpond, a dammed cypress swamp, in Isle of Wight County. Proceeding there, we found the stream covered with pondweeds. Among them were P. epihydrus, var. Nuttallii (Cham. & Schlecht.) Fernald, which, when we got it in the Chickahominy, fifty miles to the north, was then the first from south of the Potomac. Another pondweed, not yet fruiting, puzzled us but we looked forward to securing good fruit in late August. Going on to the pine barrens south of Lee's Mill we found, as we had expected, most of the characteristic plants of such areas; these need not be here enumerated. A few (very few) plants of Calopogon pallidus Chapm. established a record for Isle of Wight; and over the county line, just within Nansemond County, there was a bank of Xanthorhiza, bringing that upland species pretty far out into the Coastal Plain. The plant which most interested us, however, was an undescribed Diodia, with oblong leaves. It is here abundant in loosened sand, as along the Camp Company's lumber-railroad, and it had been on our minds ever since we originally got it in a similar habitat in 1936. It will be described in Part II. Near the road which skirts this barren there is a fine tree which is obviously a hybrid of Quercus cinerea and marylandica, X Q. carolinensis Trelease, new to the state; and, to continue evidence of the difficulties caused by Q. cinerea, near Cathole Landing we found  $\times Q$ . caduca Trelease  $(Q.\ cinerea \times nigra)$ .

Renewing the visits to the Nottoway, we first stopped at the bridge slightly southeast of Stony Creek; and there, instead of by the common pilose-leaved Solidago gigantea, the species is represented by the transcontinental and northern (Quebec to British Columbia, south to upland of North Carolina, etc.) glabrous-leaved var. leiophylla Fernald (S. serotina Ait., not Retz.). The other plant of special note, as not recorded in previous years from the Stony Creek region, is the leafystemmed yellow-flowered Viola eriocarpa Schweinitz, a relatively northern and inland plant which we were amazed to find on the Coastal Plain. As I shall show in Part II the name V. eriocarpa is antedated by 19 years by V. pensylvanica Michx., the name I am reviving. A little farther up-river, where the automobile-road crosses the Nottoway east of Huske, the bottomland-woods are particularly fine. Here are the common species of such habitats, and some not so general, such as Elymus riparius Wiegand, rare in eastern Virginia, and Eryngium yuccifolium, sufficiently local to be worth here recording. All the Corylus americana here and wherever we have subsequently examined it in southeastern Virginia has glandless involucres. It is the shrub described by Alphonse DeCandolle as var. missouriensis on account of this lack of stalked glands on the involucre. The shrub with the involucre stipitate-glandular was assumed by him to be C. americana Walt.; but it is usually more northern in range than var. missouriensis. Walter made no mention of glands in describing his material from South Carolina and I have seen no material of the species from his region. His herbarium, preserved at the British Museum, is now inaccessible, but when it can be reached examination of the involucre will be in order. The most thrilling plant of this bottomland, however, is something apparently quite new. With prolonged and very pilose sheaths covering the nodes, the Bromus here has the folded lemmas with flat sides, the 2nd glume 5- or 7-nerved. It is quite unlike B. purgans, abundant along the James, a plant with exserted nodes, strongly inrolled lemmas and 3nerved 2nd glumes. B. purgans in eastern Virginia flowers from late May into June and by late June the spikelets are

disintegrating. Our Nottoway plant begins flowering when B. purgans stops and continues through July. In its included nodes and prolonged sheaths, as well as in its flat-sided lemmas, it suggests the appropriately named northern and western B. latiglumis (Shear) Hitchcock, but that species has unique sheaths, with broad, horizontal summit-flanges prolonged into tapering appendages, and it differs in other characters from the Nottoway plant; incidentally, at the southern extension of its range B. latiglumis flowers from mid-August through September. In Part II I shall describe the new plant and illustrate details of all three species (PLATE 670). We also found it along the Nottoway at Green Church Bridge, Readjuster Bridge and Double Bridge, but could not find it on the James, the Blackwater or the Meherrin. Like the new Carex it is, so far as we yet know, "not away from the Nottoway". At Readjuster Bridge splendid trees of Acer floridanum still held their fruit (near Yorktown a month earlier the fruit had all fallen). Here the prickly vine, with fiddle-shaped leaves suggestive of those of Smilax Bona-nox, is, Long assured me, S. hispida. I bow to his understanding of the genus; I completely lack it, nor can I get real comfort out of any treatment I have seen! Acerates here was quite as perplexing as Smilax; again I give up. But the beautiful tall Phlox, abundant at the borders of swampy woods (south of Peanut) was more comforting. With its mottled stem, long-attenuate leaves and very prolonged and cylindric inflorescence it is unmistakable P. maculata, although the first we have ever met on the Coastal Plain of the state.

One day, having only a remnant of time, we went to Richmond to look for weeds about freight-sidings and waste lots. The crop was good but only a few species are worth comment. Potentilla millegrana Engelm., native of the prairies in the interior of the country, has come east; it is accompanied by superabundant Froelichia gracilis, upon which I commented a year ago, and along the canal from the James and all over the adjacent woods in one area the yam, Dioscorea Batatas Dene., has taken full possession, climbing high or trailing in solid mats on the ground, the stems high in the trees abundantly flowering, those on the ground bearing only axillary small tubers, like tiny potatoes. A similar weeding of Petersburg yielded the

subtropical weed, Gnaphalium spathulatum Lam., the European Sambucus nigra L., probably thrown out from cultivation, and a second species of Richardia. In 1939 we were at first much excited when we found a solitary plant of the tropical American R. scabra L., but when, soon after, we found solid acres of it the thrill was lessened. In 1940 we did not happen to see R. scabra. Instead, we had a run on another tropical species, often in great abundance, R. brasiliensis (Moq.) Gomez. Small cites it only from peninsular Florida but in Dinwiddie and Henrico Counties, Virginia, it is well established. The distinctions, not too sharply brought out by Small, will be discussed in Part II.

We wished to get to Cedar Island in Back Bay where, in June, 1935, we had found, with Griscom, so many interesting plants. My friend of many years, Dr. Thomas Barbour, with characteristic generosity offered us the use of the old family place at Barbour Heights, on the outer side of Back Bay; but, since we learned of an available motor-boat which daily made the round trip from near Back Bay village to Cedar Island, it seemed simpler for us to cross in that way. On July 15th, therefore, we drove to Virginia Beach, thence to Back Bay, to consult Mr. Beals, who was in charge of renovations going on and some new construction for the club on Cedar Island. From Century House to "the Beach" was more than 100 miles. When we had ridden about three-fourths of the distance Frank meekly asked: "Are we going way through to the Beach without a stop? I'm dying for a smoke". We were speeding along the great trunk-road, without parking possibilities, which cuts directly across the northern edge of the Great Dismal Swamp. Hopeful tests in the past had invariably shown this stretch of clearing to be an almost uniform and uninspiring cane-brake, a dense jungle of Arundinaria higher than one's head. At the next cart-road, however, we turned in and parked. Frank was to have his smoke and we would get out and stretch. Almost immediately, however, the stretching was for a curious herbaceous Smilax, with leaves ending in almost tendril-like excurrent midribs. While we were puzzling over this (Long did not tell me just what it is) and collecting specimens, we wondered at the Scleria which here makes clumps, with arching culms and

pendulous or drooping axillary inflorescences. It somewhat suggested S. setacea Poir. but we were too familiar with that slender plant to see more than a habital suggestion. The achenes were perfectly smooth as in S. triglomerata, S. nitida Willd. and S. minor (Britton) Stone; yet it was none of these. The obvious procedure was to "play trumps". So we took a series; and study shows it to be S. flaccida Steudel, described in 1855 from somewhere in South Carolina and not subsequently recognized. The only material in the Gray Herbarium, besides our plant from Norfolk County, is from Florida, Mississippi and Louisiana. Its technical characters and other details will be discussed in Part II. After that experience we encouraged Frank to stop for a smoke whenever he wished!

There was some time for botanizing before dark and, as most wild areas between Virginia Beach and Munden had been visited by us at this season, we hit upon Sand Beach for our quest. We knew it of old but, coming here at a slightly different season, we proceeded to collect a few species not previously noted; and we ate, inordinately perhaps, the luscious big fruits of Rubus Longii Fern. Of the numerous blackberries of southeastern Virginia two stand out in memory and are always sought for their superlative fruit, the stiffly branched and often upright R. Longii of relatively sterile and dry soils, and the prostrate R. Grimesii Bailey, also of sandy or dry and argillaceous openings. Both of them should have a place among cultivated fruits. Juncus bufonius was here, a seemingly inane observation, but in nine years of botanizing in southeastern Virginia we have only rarely met this reputedly ubiquitous and supposedly cosmopolitan annual! Panicum caerulescens, a regular inhabitant of damp flats back of the dunes, was also present and with it was the northern coastwise Elymus virginicus, var. halophilus (Bicknell) Bush, our first from south of New Jersey. We also found a new station (this on an inlet to Rainey's Pond) for the always surprising and usually very local Limnobium Spongia; while the small Galactia on the flat back of the dunes threw me into perplexity. I thought that I had settled Galactia for the manual-range, but here and at other stations later in the season I became very humble. The group (likewise Strophostyles) needs fuller collecting; after that it needs a friend who understands it!

Promptly on the morning of the 16th we crossed with Mr. Beals and his helper, a young carpenter, to Cedar Island. The island has not been too much cleared and we were delighted to get back to the flora seen here six years earlier and to that seen on Long Island a year before. Those species need not again be enumerated. The forest is largely of superb Live Oak, both the typical small-leaved tree and the larger-leaved Quercus virginiana, forma macrophylla (Sargent) Trelease; and we gazed with delight at the great masses of Ampelopsis arborea (L.) Koehne high in the trees and repeatedly remarked upon the subtropical aspect of the forest. Smilax again intruded problematic tangles in our path. We did not mind the tangles; the problems are what worry me! Kosteletzkya virginica was here represented by the coarsely and heavily rough-tomentose southern var. altheaefolia Chapm. (K. altheaefolia (Chapm.) Gray), which we had not previously known so far north; the pools were full of true Potamogeton pusillus (P. panormitanus Biv.), not recorded from south of the Potomac; and at the southern end of the Island we came upon an extraordinary exhibition of Typha angustifolia, with the pistillate spikes variously slit into partially united, partially separated strands or quite split to base into 2-5 spreading or drooping portions. Just such abnormalities were discussed by Dr. Harold St. John in Rhodora, xliii. 85-91 (1941).

When the day's work at carpentering was finished Mr. Beals offered to land us, if we had a permit, on Ragged Island, part of the government holdings. My permit from the Superintendant, Mr. Harry Bailey, took care of this question and in the few minutes available we snatched, near the wharf, Erigeron bonariensis L., Pluchea purpurascens (Sw.) DC., Verbena scabra Vahl and other specialties of Long Island reported a year ago. Three large oaks stand near the landing. One is characteristic Quercus virginiana, another seems like a hybrid of Q. nigra and Q. Phellos, and the third, so far as I can see, is the hybrid,  $\times$  Q. ludoviciana Sargent (Q. falcata  $\times$  Phellos). A visit to these islands and to False Cape, late in the season, when the marsh plants are mature, would well repay the acute botanist.

We had been inclined to be sentimental over the great festoons of the rather rare Ampelopsis arborea, covering the Live Oaks on Cedar Island. Consequently, when, two days later, we stopped to investigate the adventives along the railroad east of Franklin and the plants of a waste lot in Franklin, we felt rather cheap: Ampelopsis arborea was there as a weed! Other weedy plants, like Euphorbia marginata, obviously came from garden refuse, though now well naturalized; but the abundant Croton monanthogynos, its range extended north from North Carolina, surely came out of no garden.

This stop was made on our way to the region of Joyner's Bridge, to follow side-roads through the sands east of the Blackwater. We had already visited the Bridge at three different times, but it was still possible to extend into Isle of Wight County a good number of southern species, Bulbostylis ciliatifolius and Paronychia riparia Chapm. for instance. The new Diodia, already referred to, was here abundant; the recently described Tephrosia spicata, var. semitonsa Fern., here almost justified omission of the qualifying first syllables of its name; and Galactia again caused perplexity. On one tree of Quercus Phellos the very narrow leaves had their lower faces white with minute pubescence; ordinarily, no matter how broad or how narrow the leaf in eastern Virginia, it is green beneath. Something may eventually come out of study of this complex group. The last plant to be mentioned from the July collections is a tall variety of Lyonia ligustrina, with unusually large fruits, found along a woodland branch near Joyner's Bridge. It proves to be the shrub described by the British dendrologist, Watson, in 1825, from a specimen cultivated in England, as L. capreaefolia. From the mass of variations of L. ligustrina I am able to pick out a series representing the same extreme and found from Florida to Texas, north to southeastern Virginia, western North Carolina, Tennessee and Arkansas. It and the other varieties of the species will be discussed in detail in Part II.

Northern papers had had brief mention of unprecedented mid-August freshets in Virginia and the Carolinas, but it was not until we reached Richmond that the vastness of the calamity fully impressed us. All Virginia from the lower James River southward and much of the two Carolinas was under water. A

week of torrential and unceasing rain, from the mountains to the Coastal Plain, had disrupted all normal traffic; much of Richmond, Petersburg, Franklin and other cities were drowned and it was impossible to guess when or where one could go and come. On our way to Century House long after midnight a guard stopped us, to say that we could not go far on U. S. Route 1; and next morning, when we started on two weeks of botanical exploration (August 19 to September 2), we were flagged at the start toward Courtland and Franklin and told that we could not even reach Homeville. Going on until we found the road completely submerged and were told of cars and families swept off the road by onrushing back-waters, we turned back some miles northwest of Homeville; instead of rare plants being "not away from the Nottoway" the river itself was miles away from the Nottoway and the plants within its reach were all ruined until the next spring. Since all roads leading to the Nottoway, the Blackwater and the Meherrin were thus deep under water, the stronger bridges drowned (sometimes, we were told, under 40 feet of rushing water), and all weaker bridges gone, our beautiful plan to devote our energies to the wooded bottomlands had also gone.

The only dry area we could think of was the freight-yards and waste land about Broad Street Station in Richmond; so we went there for the rest of the day. North of the station the waste ground and cinders were, at this season, a carpet of small adventives, the taller weeds having been destroyed. Plantago indica L. (P. arenaria W. & K.), now becoming rather general from Maine to Virginia, formed tiny thickets of bushy-branched plants and Richardia brasiliensis, here in flower and fruit, was abundant; but, having already had that, we were more interested in the mats of a somewhat arched-ascending Euphorbia which was new to us. It is very abundant and quickly distinguished at a glance from the prostrate E. supina Raf. (E. maculata of authors) and the nearly erect E. maculata L. (E. Preslii); and we found it next day some miles away, also on railroad cinders. It proves to be E. humistrata and adventive (like the equally abundant Froelichia gracilis) from west of the Alleghanies. Another plant new to our experience was a stiffly branched Anthemis with very short ligules, the Mediterranean

A. secundiramea Bivona, apparently a very recent arrival in America. At another freight-yard, where the clerk was much interested and helped us search for Zornia bracteata, which persists or has been slightly introduced there, we were delighted to find the southern Erigeron quercifolius Lam. We had collected it two years before in just such a place, the freight-yard at Charleston, South Carolina, but it has not been recorded from north of North Carolina.

This was only a small terminal but we were advised to go to a very extensive yard which was pointed out to us, for there we would surely find many additional species, brought in on freight-cars of one of the large transportation lines. Something in the proposition, which we took to be an invitation, miscarried or failed to coordinate; for next morning, when, driving up from Petersburg, we started into the extensive yard, we were promptly taken in charge by a plain-clothes detective and held for some hours, while questioned by one officer and another and by varying grades to higher officers, as "German spies" who had been "under observation for days" (we had driven to Richmond at noon the day before, returning to Petersburg for the night) and who were hiding their operations under the pretense of "looking for a weed". "Looking for a weed; get that? Yeah, looking for a weed!" The "false" white beard and the queer glasses (bifocals) of the old man were conclusive evidence and his botanizing pick was corroborative. Our friends in Richmond, deans and professors at the University, were all on summer vacation; the ticket-agent at Petersburg, through whom I had for years made reservations, could not be reached, the Norfolk and Western station in Petersburg being under water; Mrs. Bowman had gone shopping and all others who could identify us were away! It was a hot morning, so we had left our coats, containing letters, at home. There we were! When the Chief arrived, however, he graciously took us to Frank's waiting car where, fortunately, I dug out from among our contour-maps (government maps!) a letter two years old from our friend, Mr. John B. Lewis, then of Amelia, addressed to me at the Gray Herbarium. That was verification of our statement that I was Director of that institution, which had

meant nothing to the Richmond police; and after a friendly visit with the Chief and the Police Commissioner we went on our way, with the good advice: in these feverish times always have identifications on your persons! We now do so. Every field-naturalist should. We are, to the officers, "queer people".

During the inquisition one of the police-officers had amused himself making imaginary passes at everyone near with my botanizing pick and exclaiming over its wickedness as a weapon. This implement is a copy of a Mexican tool brought from there many years ago by the late C. G. Pringle. Consequently, when, next day, the front pages of the papers carried pictures of Trotsky, his Mexican murderer and the implement used (the prototype of my pick), we congratulated ourselves that the pictures had not come out twenty-four hours earlier.

We had started for Yorktown to get better material of the tropical American Euphorbia ammannioides HBK. which, when, almost in the dark some years before, we had collected it there, was at its first known station north of Florida. We were so unnerved by the morning's experiences, however, that we hesitated to leave the car; and when we reached the sand-beach above Yorktown we were at first disappointed to find nothing but Euphorbia polygonifolia along the lower and looser sand of the beach. Nearly ready to give up, we went to the upper border of the beach. There, in more firm and unshifting sand, was our plant, plenty of it and at once recognizable by the bluish- or dark-green color of the foliage, that of E. polygonifolia being a paler green. When we crossed the James River Bridge from near Newport News we saw that below the south end of the bridge there was a sand-beach, outside the salt marsh. There, again, was E. ammannioides, in the same relation to E. polygonifolia as at Yorktown; and in the following days we trailed the two, always in the same relative positions and always quickly distinguished by color, along the sand-beaches of the James up-river into Surry County. Euphorbia ammannioides, although tropical, is surely at home in Virginia.

<sup>&</sup>lt;sup>1</sup> Some years ago a prominent German botanist, finding, upon reaching Harvard Square, almost no one who could help him, eventually discovered a taxi-driver who had taken me to the Gray Herbarium. "Why", he said upon reaching his destination, "everyone in Germany knows the Gray Herbarium".

One point was very clear. Whereas up-river all streams were at freshet-pitch, the broad estuary of the James, confluent with Chesapeake Bay, had quickly disposed of the surplus; the beaches and tidal reaches of the lower James were available for exploration and Euphorbia ammannioides indicated real discoveries to be made. Before concentrating on a programme so suddenly conceived we had to do what we could with some already known areas. The road to Emporia was open; so we could follow up problems in that direction, but we at once found that the Nottoway was still on the rampage. I have referred to the occurrence of the isolated colony of Vicia grandiflora by a woodland path northwest of Emporia. At the border of the same woods, on one side of Three Creek, the still pretty local Asiatic Arthraxon hispidus (Thunb.) Makino, var. cryptatherus (Hackel) Honda, abounds; across the Creek, the woods are bordered by the tropical Asiatic Eulalia viminea (Trin.) Kuntze, a decidedly local adventive. Below Double Bridge it was impossible to approach the Nottoway. A mile away from the river a dislodged wooden bridge was poised in the branches of forest-trees and plants beginning to be uncovered by receding waters were unrecognizable, crisp and black. The still unidentified Aconitum was intact, however, but, as already noted, with little promise of ever flowering.

At Chub, as soon as the river had somewhat receded, the whole area became a breeding haunt for mosquitoes. With heads as much veiled as possible we fought our way through their devouring hordes and soon found in the sand a sedge quite new to our field-experience, another southern plant not previously known in the state, Bulbostylis coarctatus (Ell.) Fernald. At first happy to collect midgets a few inches high, we soon became selective and would touch nothing which would fill less than the length of the herbarium-sheet; and a few days later we again found this fine species, this time east of Cypress Bridge in Southampton. Lespedeza here was perplexing; it always is. In Part II I shall discuss and illustrate some of the complexities of the genus, but there are others still unsolved. At the border of the hickory and oak woods already noted, where Sanicula marilandica, Hexalectris, Psoralea canescens and Scrophularia lanceolata occur, we found our first

Chenopodium Boscianaum. For a plant originally collected in the Southeast it is remarkably local in eastern Virginia; in New England it is far more common. In the sandy border of a thicket Centrosema virginianum was heavily flowering. Since we are inclined to pass this showy plant as not important to collect, I here relented a little and suggested taking just two plants, one apiece, to show complete root-systems. This we did, and upon labeling the material months later it became evident that we had unwittingly got the southern extreme which was described by DeCandolle as Clitoria virginiana, \beta. elliptica. This is its first collection from north of South Carolina. In fact "the first from north of South Carolina" is the key-note to botanizing in the region of Chub. Nevertheless, in dry sand only a little to the south the boreal Lycopodium tristachyum (Newfoundland to the Lake Superior region, south to the mountains of North Carolina) forms the largest and healthiest carpet either Long or I had ever seen!

Worried concerning the fate of the unidentified pondweed in the outlet of Lee's Millpond, we soon went there. Ordinarily it would be about 60 miles by road but, since we could nowhere cross the Blackwater and much of Franklin, on the west bank of the river, was still afloat, we were forced to go 100 miles around to get there. Nothing which could be identified by the most acute student of fossil peat remained; the outlet-stream, with its mat of floating aquatics, was a deep trough of bare mud. Proceeding toward the pine barrens to the south we soon found the road at the foot of one slope wholly submerged. The Blackwater was still chiefly a back-water. Eventually reaching portions of the pine-barren area, we found Carphephorus tomentosus, var. Walteri (Ell.) Fern. and Andropogon virginicus, var. glaucus (Muhl.) Hack. (A. capillipes Nash), both new to the county, in great abundance. Symplocos tinctoria was represented by a dwarf shrub, sometimes only a foot high, with very small yellowish leaves. The late Judge Churchill once got the same dwarf near Norfolk. It seems to be worth varietal recognition. Juncus abortivus Chapm. was everywhere abundant, while Asimina parviflora and Cleistes divaricata (L.) Ames, also new to the county, were scattered.

Having cleared off the problems held over from preceding

trips, we now started for the lower James; and the farther east of the Piedmont we went the nearer to the Blue Ridge and the Shenandoah Valley we seemed to be, until at the farthest point eastward which we reached, the rapidly disintegrating Miocene bluffs below old Fort Boykin (north of Smithfield), we were getting our first Coastal Plain collection of the northern and inland Celastrus scandens; while here Campanula americana (MAP 7) and Lobelia siphilitica, wide-ranging upland and inland species, were as abundant as farther up the James or as in the mountains, and Thaspium barbinode here attained a height well over three feet. We visited the shores or woodlands near the James at seven stations in Surry and Isle of Wight Counties and everywhere the continental and montane species outnumbered those of the Coastal Plain. This, of course, is due to the highly calcareous Miocene fossil-beds here at the surface, where inland as well as coastwise calcicolous types have every encouragement to growth.

The westernmost area examined was slightly above Claremont, where deep ravines have been cut by small streams entering the James. We already knew, slightly east of our present ravines, fine colonies of such localized specialties as Athyrium thelypterioides (Michx.) Desv. (the largest we ever saw), Carex Jamesii, Hybanthus concolor, Euonymus atropurpureus, Aralia racemosa, Stachys Nuttallii and scores of other calcicoles of the uplands; but, starting upon a new ravine, we gave a real shout when we promptly walked into a carpet of Athyrium pycnocarpon (Spreng.) Tidestrom. That surely was one of the last ferns to be expected on the Coastal Plain. Ponthieva racemosa (Walt.) Mohr was, of course, here, as at other such places in the county, and Pedicularis lanceolata and Aster infirmus we had occasionally found before, farther west; but when we came upon colonies of the orange- to vermilion-lipped Malaxis floridana (Chapm.) Kuntze, almost at its northern limit, and, while following up its several scattered patches, came upon clumps of upland Triphora trianthophora (Sw.) Rydb., nearer the southeastern border of its range, we had difficulty in restraining our joy. For seven years we had sought in vain the southern Eupatorium incarnatum, long ago reported from Virginia. Here it was; and with it the northern and inland Desmodium bracteosum

(Michx.) DC., new to the Coastal Plain list. On a drier slope, with Cunila origanoides, which we had known on the Coastal Plain only at a point 35 miles to the southwest, in Southampton County, there was a colony of Arabis canadensis (Maine to Minnesota, south to the Blue Ridge and Alleghenies of Virginia, thence to the mountains of Georgia, etc.). We ought to have been satisfied; but, looking along the spring-fed bottom, where in May we had got the northern and montane Carex prasina and where the leaves of Senecio aureus reached a diameter of 9 inches (!), we had a new thrill. There was unmistakable Senecio Crawfordii Britton, the local species of southeastern Pennsylvania and adjacent region, with its previous authenticated southern limit in Prince George County, Maryland. It is useless to deny that Claremont is a rich botanical center. We always make discoveries there and only a few limited spots in the region have yet been touched.

Along the western end of Cobham Bay, as at Scotland for instance, the famous fossiliferous bluffs of the James are so indurated as to support only a tediously uninspiring living flora, although the paleontologists apparently give the Scotland bluffs superior rank. Consequently, when, desiring to get at sandy beaches on the James, we put the proposition to Frank, we were not over-enthusiastic as he told us of a sand-beach on Cobham Bay. When we got there, however, slightly to the west of Chippokes, one day would not suffice; we came again next day. The steep wooded bluffs have a fine forest, with Hop Hornbeam, Slippery Elm and other trees of rich upland prevailing, and at the bases of the slopes or in the thicket back of the beach the upland vegetation was highly developed, with Equisetum arvense here largely represented by the gigantic extreme with forking and reforking branches, forma pseudosylvaticum (Milde) Luerss., which, judging from the 2 sheets accumulated by Alvah Eaton, is a very unusual plant. Many upland species already known along the river, Stachys Nuttallii and others, would have thrilled us if we had first come to the lower James at this point. They need not be mentioned here; but typical Eupatorium sessilifolium was our first from the Coastal Plain, although we had now become somewhat hardened to E. sessilifolium, var. Vaseyi (Porter) Fern. & Griscom. And

on the sands, at the farthest point up-river we have yet found it, was the long-sought Euphorbia ammannioides, from here down-river afterward pretty generally seen. Here, too, was the inland limit on the James for Diplachne maritima Bicknell, which we had previously seen only about Back Bay; and Lythrum lineare we know only slightly farther inland.

Cobham Bay is separated from Burwell's Bay, farther downriver, by a point, to the north of Bacon's Castle, which ends in a great flat of sands and marsh-land, Hog Island. It was here that the original proprietor kept his hogs early in the 17th century, and it was appropriate that, crossing the creek to Hog Island, we should immediately hear the unmistakable squealing of hogs. These and cattle have full control of the place but the genial owner gave us permission to share the vegetation with them. In some marshy spots, fenced off from invasion, as too soft and dangerous for heavy animals with sharp hoofs, we established new inland limits for maritime types: Distichlis spicata, Spartina alterniflora var. glabra, Eleocharis parvula, Juncus Roemerianus and Sabatia stellaris (with the white-flowered form abundant). This was all most interesting but we were still more pleased with shallow pools solidly filled with Ammannia Koehnei, var. exauriculata Fernald, for this variety of a relatively rare species had been known only as an endemic of the marshes of North Landing River in Norfolk County. Three to four centuries of occupation by cattle and swine of flat and steaming Hog Island, with almost tropical heat and plenty of open woods and thickets, had greatly encouraged ticks. We never imagined so many; and when we got back to the car and found poor Frank stripped and desparately extracting the hundreds of peppery little seed-ticks which had got him and had instantly burrowed in, we were ready to leave. Frank's clothes were safely concealed under a closed cover, to be fumigated on the return home, and he was forced to drive all the way back to Petersburg, girdled in a string and a loin-cloth devised from a small piece of balloonsilk which I used as a shoulder-cape during thunder-showers. Luckily we had no encounters with the police on the way. Hog Island has some obvious disadvantages.

The broad sweep of Burwell's Bay, from above old Mac-

kimmie's Wharf to Day's Point below old Fort Boykin, has its chief village a little back from the western shore, Rushmere, called on the contour-sheets of 1907 Fergusson's Wharf (a name almost forgotten, while the settlement near old Mackimmie's Wharf is now Bailey's Beach). We tried the shore at three points: at Bailey's Beach (Mackimmie's Wharf), at Rushmere, and below Rushmere at a beach-resort which has now monopolized the name Burwell's Bay. If you ask for Burwell's Bay, the native, from Smithfield to Surry, thinks of this resort rather than of the 7-mile sweeping arc in the south shore of the James. Alternating bluffs and depressions are back of the sand-beach. The depressions are chiefly cypress- and gum-swamps, often with bayou-like forking pools of black water. The bluffs are steep, all fossiliferous and with broad hard bands, ragged with the solidified shells of giant Miocene mollusks, shark-skeletons and other sharp protuberances, alternating with other broad bands of soft and seeping or oozing white shell-bearing marls, with the shells soft and disintegrating, the springs bubbling out at all heights, from crests at 30 to 60 feet above the river or from the bases of steep slopes back of the beach. The forest was largely of the richest upland type, with a grand mixture of the commoner inland species interspersed with Juglans cinerea, Quercus montana, Ostrya virginiana, Acer floridanum Pax, and Tilia heterophylla. These are not Coastal Plain types; but the abundance of the fiercely armored Hercules'-club, Zanthoxylum Clava-Herculis (Florida to Texas, north to southeastern Virginia and Arkansas) back of the beach, there associated with Bumelia lycioides, var. virginiana Fernald (lower James to Cape Henry), the carpets on the sand of the coastal Euphorbia ammannioides again, with the coastal Diodia teres, var. hystricina Fernald & Griscom (Cape Charles and Cape Henry), and the abundance at the bases of the seeping bluffs of the coastwise (tropical America, north to eastern Virginia) Verbena scabra Vahl—these convinced us that we had not been set down in the Shenandoah Valley or on the slopes of the Alleghenies. Vegetation was rank: Equisetum hyemale, var. affine nearly 6½ feet high; the annual Impatiens biflora 8 feet high, with trunks 2-3 inches in diameter; Hydrangea arborescens with leaves sometimes nearly 6 inches broad and cymes more than

7 inches across. We took many species for record of extreme size and were occupied with this innocuous diversion when suddenly, in the deep crannies of a fallen and very ragged chunk of a sheer cliff we detected *Pellaea atropurpurea!* Long went back through the tangle of lianes (*Decumaria* and *Berchemia* tangled with *Menispermum*, *Rhus radicans* and *Smilax hispida*, made navigable by sprangling brambles 12 or 15 feet high) and found the sheer hard cliff closely covered with gigantic *Pellaea*. That, again, is not a Coastal Plain type.

Where the bluffs consist of soaking-wet slippery marl the northern and inland Epilobium coloratum was tall and of shrubby aspect (a fragment of a lateral branch fills a sheet) and the coastal Polypogon monspeliensis, lopping its old panicles into the seepage, where the grains had all germinated, was fantastic with its miniature terminal lawns of young seedlings! In such habitats an Erigeron, relatively small on drier ledges, was producing basal rosettes with crisply brittle and fleshy, smooth leaves up to a foot long and 4 inches broad; and its old and shrivelled stems, in late August, often lopped over into perpetually springy paste, were taking root at the upper nodes and there producing new rosettes with fresh flowering stems. This was a most novel plant, with abundant white rays; and when, in June of the current year, we found it everywhere characteristic of the springy and seeping bluffs from below Fort Boykin, in Isle of Wight, nearly to Sunken Meadow Beach in Surry, and in September on the marl-bluffs of Claremont, it became evident that these unique calcareous walls along the lower James support a unique and endomic species of Erigeron. This will be further discussed and illustrated (Plate 695) in Part II.

Vitis was a hopeless tangle. All the regular species of eastern Virginia there abound, with V. aestivalis mostly represented by the northern and upland var. argentifolia (V. bicolor of most authors). Others are precariously close to V. Baileyana (western Virginia, westward and southwestward) and sprouts, where fire had run, were perplexing, with deeply cleft leaves, the middle lobe strongly constricted near the base, the veins of the lower surface copiously hirsute. This was a puzzle but Long insisted that it was ordinary V. vulpina (V. cordifolia),

which has essentially unlobed long-pointed and glabrous foliage. As usual, he was right. In June of the present year I found these long sprouts with much dissected hirsute-veined leaves coming from the base of a large vine. Pulling it down from the trees above, there it was, with foliage of the flowering branches uncleft, rounded, long-acuminate and glabrous, typical V. vulpina. Ho, hum!

When, snatching a few minutes for lunch, we spread a cloth in the shade near the summer-cottages, we found that the broad carpet all around was a great mat of the Old World *Potentilla reptans*, a relatively rare species in America and not, I think, recorded from Virginia. At this station it makes a continuous carpet in the cleared and settled area, although, as we found last June, sharing the ground with other local adventives.

Below the bluffs there is a broad sand-beach (very weedy with ubiquitous Saponaria, Melilotus, etc.) and back of the beach a swamp of cypress, gum and other paludal trees. In the thicket between the beach and the swamp many fine species prevail; best of those, not already known from along the lower James, is Eupatorium altissimum, another montane species. In the edge of the wooded swamp I picked up a single specimen of Malaxis floridana which, the day before, we had seen in some quantity farther west. There must be more but we did not see it. Sabatia calycina, the first seen so far north as the James, and Echinodorus radicans, also new to our list of James River plants, were here; while the wonderful pink flowers of Kosteletzkya virginica, with a spread of 2½ inches, were so much larger than those of New Jersey and Long Island that in Part II I shall attempt a clarification of the group. The great excitement here, however, was caused by the big clumps of a tall and arching Carex, with flexuous panicles shattered but still handsome. We got it again in the cypress swamp back of Bailey's Beach, and in June of this year fresh and sumptuous material shows conclusively that it is one of the rarest of sedges, Carex decomposita. Singularly few sheets exist in the Gray Herbarium showing actual localities; they are mostly of specimens collected before 1870, the single or rare old vouchers with only the state indicated: duplicating sheets from Penn Yan or Junius or Ontario County, in western New York, all nearly

a century old; more modern ones from near Great Falls on the Potomac in Maryland; old specimens marked simply "Florida, Chapman"; others, as vague, from "Ohio, Sullivant" and "Michigan Territory, June 1832, Folwell"; one, with modern data, from Edmonson County, Kentucky, Svenson; one from F. L. Harvey with no further information than "New to my collection of Ark[ansas] plants. Only this specimen seen"; one from Lawrence County, Alabama, June 26, 1867, T. M. Peters; and the usual indefinite sheets from "Louisiana, Hale". Two others from the Southeast have good data and are significant because Mackenzie (N. Am. Fl.) excluded both these states from the range: 1 mile southwest of Williamsburg, Virginia, Grimes; base of cypress-tree, Greenfield Lake at Wilmington, North Carolina, Godfrey & Wells. From such data it is impossible to make a satisfactory map, and state floras regularly indicate the great rarity or early extermination of the plant. In Isle of Wight County material for all herbaria can be easily secured!

I must here content myself with mention of only one more plant. Spanish Moss, Tillandsia usneoides, had been known to us in Virginia only in eastern Princess Anne County and near Eastville on the Eastern Shore. It was, consequently, a great surprise, looking up from caring for Carex decomposita, to see the familiar balls hanging from branches overhead. They were quite beyond reach, but by balancing on a slumpy knoll and reaching up with a long branch, Long, after many efforts, succeeded in twisting off a few fragments—enough to establish the record of Tillandsia up the James to Isle of Wight (nearly to Surry).

We needed fresh material of one of the tidal plants of the Mattaponi to complete a record published a year ago. We thought we had sufficiently explored these fresh tidal shores in the autumn of 1939, but, returning to the region of King William Courthouse, we found that one of the supposedly rare species of Bacopa, which, in 1939, we had found so extremely scattered that we spent back-breaking hours in assembling a few sheets of meagre specimens, now formed carpets here, farther up-river and across the Mattaponi in King and Queen County. It was a simple matter to lift mats which cover quarter of the area of a standard herbarium-sheet. I thought I knew what it was,

but in August and September of the current year its abundance in equally extensive carpets along the Chickahominy, where it associates with other members of its affinity, raises new questions of identity, so that the solution must be held over until thorough study of the series can be undertaken. This should have satisfied us; but a tall Echinochloa with lax and open flexuous panicles up to a foot or more long, the spikelets nearly smooth, the long leaves membranous, was everywhere in the estuary, the culms floating at high tide or the panicles becoming submerged. This was something quite new to us. It seems to be the tropical American E. crus-pavonis (HBK.) Schultes, its northern recorded limit almost 800 miles away, in southern Alabama. As if that were not enough, for an estuary already "worked out", Najas at low tide began to upset our calculations. The material secured belongs to three species. Before they can be satisfactorily settled additional collections, especially at a later season, must be secured. They illustrate again the complexity of the flora of southeastern Virginia and emphasize, as I shall doubtless repeat until the end: there is plenty to do; there are few thoroughly prepared to do it.

## PART II. RANGE-EXTENSIONS, TECHNICAL NOTES AND REVISIONS

In Part II I have assembled, mostly in briefer form for quick reference, the principal records of range-extensions found in the preceding diffuse narrative. With them are some not there noted. Several revisions of groups found in eastern Virginia are included, though the study of Rhus aromatica, not growing directly out of our field-work, is here published that it may be associated with the discussion of R. Toxicodendron and R. radicans, based largely upon Virginian experiences. A few records not our own are also added, since they pertain to the region, southeastern tidewater Virginia, primarily studied. As noted at the opening of the paper, we were helped through a grant to the author from the Penrose Fund of the American Philosophical Society. This grant, for which I am deeply grateful, covered the expenses of automobile and boats as well as the employment of an efficient helper through the season. The original photographs for illustration were made chiefly by Dr. Walter H. Hodge, while a teaching fellow in the Laboratory of

Systematic Botany at the Gray Herbarium. Their cost and that of the engraver's blocks has been defrayed through an appropriation for personal research from the Department of Biology of Harvard University. Their reproduction has, with his customary generosity, been made possible through aid from Mr. Long. In the citation of specimens (except in new descriptions or in revisions) the names of the collectors, Fernald & Long, are omitted. Plants thought to be unrecorded as members of the flora of the state are indicated by an asterisk (\*).

DRYOPTERIS CRISTATA (L.) Gray. To the very few known stations in Tidewater Virginia add one in Southampton County: low sandy woods along Wakefield Road, northeast of Sebrell, no. 11,921, a small and highly localized colony. See p. 492.

ATHYRIUM PYCNOCARPON (Spreng.) Tidestrom. Surry County: bottom of rich calcareous wooded ravine west of Claremont, no. 12,512, one extensive colony. See p. 520.

Our only Coastal Plain station.

Pellaea atropurpurea (L.) Link. Isle of Wight County: dry cliff and loosened boulders of calcareous conglomerate by Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), nos. 12,513 and 12,514, an extensive colony. See p. 524.

Our only Coastal Plain station.

\*Equisetum arvense L., forma pseudosylvaticum (Milde) Luerss. Surry County: wooded calcareous slopes by Cobham Bay, James River, northwest of Chippokes, no. 12,515, large plants, with branches spreading 2 dm. from the main axis.

The material in the Gray Herbarium shows none of this form from so far south as Virginia. See p. 521.

E. HYEMALE L., var. AFFINE (Engelm.) A. A. Eaton. Isle of Wight County: rich calcareous wooded slopes by Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no.

12,516, stems up to 1.95 m. high. See p. 523.

Potamogeton pusillus L. (*P. panormitanus* Biv.). New Kent County: fresh tidal marsh by Chickahominy River, at "Shady Rest", southeast of Windsor Shades (Boulevard Postoffice), no. 12,527. Surry County: tidal pools, Hog Island, no. 12,525. Princess Anne County: sand-bottomed shallow ponds, Cedar Island, no. 12,232. See p. 513.

Extension south from the Potomac.

\*P. Berchtoldi Fieber, var. tenuissimus (Mert. & Koch) Fernald (P. pusillus, var.). Sussex County: in water at margin of Chappell's Millpond (Honey Pond), west of Lumberton, no. 12,236. See p. 508.

Extension south from New Jersey and Pennsylvania.

P. Spirillus Tuckerm. To the station in New Kent County add one in King William County: fresh tidal margin of Mattaponi River, northwest of King William Courthouse, no. 12,526.

P. EPIHYDRUS Raf., var. NUTTALLII (C. & S.) Fernald. To the station in New Kent County add one in Isle of Wight County:

outlet of Lee's Millpond, no. 12,231. See p. 508.

Echinodorus radicans (Nutt.) Engelm. Local range extended north from Southampton County. Sussex County: in water at margin of Chappell's Millpond (Honey Pond), west of Lumberton, no. 12,237. Isle of Wight County: cypress and gum swamp back of the beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,531. See pp. 508 and 525.

LIMNOBIUM SPONGIA (Bosc) Richard. An additional station in Princess Anne County: shallow water, inlet to Rainey Pond,

back of Sand Bridge, no. 12,238. See p. 512.

Bromus catharticus Vahl. Henrico County: waste places and roadsides, Richmond, no. 11,931. Dinwiddie County: waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 11,930. See pp. 492 and 493.

B. Purgans L. York County: rich wooded ravine by York River, above Yorktown, no. 11,936. Prince George County to Isle of Wight County: common along the James (many

nos.).

\*B. Japonicus Thunb., var. porrectus Hackel in Magyar Bot. Lapok, ii. 58 (1903). Common in waste ground (many nos.).

Bromus japonicus has been reported from Virginia, and Hitchcock (Man.) maps it as occurring in most states from New England to the Pacific, south to North Carolina, Tennessee, Arkansas and Texas. His illustration (fig. 43) and description, with "awn . . . somewhat twisted and strongly flexuous at maturity" do not agree, however, with the bulk of eastern specimens. They do agree with Thunberg's original diagnosis "aristis divaricatis" and with B. japonicus, var. typicus Hackel, l. c. In the small representation in the Gray Herbarium the only specimen of var. typicus (with divergent awn) from the Atlantic States is one cultivated at the Department of Agriculture in Washington in 1895, though the herbarium of the New England Botanical Club contains ballast-land specimens

collected in Boston in 1879 and a sheet from mill-waste in Connecticut collected in 1912. The others are from Michigan, Iowa, Missouri, Nebraska, Alberta and Washington. All other material in the Gray Herbarium from the Atlantic States is of var. porrectus, with awns directed straight forward. It is surmised that the Virginia record (and those from many other states) was really based on var. porrectus.

\*Bromus (§ Zerna) nottowayanus, sp. nov. (Tab. 670, Fig. 1-7), culmis 0.6-1.5 m. altis; foliis caulinis 6-8, vaginis nodos plerumque superantibus imis mediisque retrorso-villosis; laminis 0.6-1.3 cm. latis paginis superioribus pilosis, inferioribus glabris vel ad costam hirsutis, basi rotundatis ligula brevi; paniculis nutantibus 0.5-2 dm. longis ramis flexuosis pulvinis vix crassis; spiculis 1.8-4 cm. longis 3-11-floris; gluma inferiore 1-3-nervia, superiore 5-7-nervia; lemmatibus dorso strigoso-pilosis 8-13 mm. longis; aristis 5-8 mm. longis; palea dorso pilosa apice plana.— Valley of Nottoway River, Sussex and Greensville Counties, Vir-GINIA: Sussex County: border of dry sandy woods, 4 miles south of Stony Creek, August 19, 1936, Fernald, Griscom & Long, no. 6519 (distrib. as B. purgans L.); bottomland woods along Nottoway River, east of Huske, July 14, 1940, Fernald & Long, no. 12,239 (TYPE in Herb. Gray; ISOTYPE in Herb. Phil. Acad.), also June 13, 1941 (young panicles beginning to show), no. 12,927; border of woods near Nottoway River, Green Church Bridge, northwest of Owen's Store, July 14, 1940, Fernald & Long, no. 12,240. Greensville County: argillaceous clearing in swampy woods near Readjuster Bridge over Nottoway River, northeast of Orion (gigantic plants with unusual number of exposed nodes, growing in rich and recently burned land), July 14, 1940, Fernald & Long, no. 12,241; rich woods along brook entering Nottoway River below Double Bridge, north of Orion, August 21, 1940, no. 12,537; bottomland woods, Nottoway River, north of Orion, September 14, 1941, no. 13,520 (ripe fruit). See pp. 509 and 510.

As noted, our first collection was distributed as *Bromus purgans* L.; but *B. nottowayanus* is technically nearer the more northern and inland *B. latiglumis* (Shear) Hitchcock (*B. altissimus* Pursh, not Gilib.). In *B. purgans* the nodes more generally overtop the leaf-sheaths; the ligule is prolonged beyond the junction (Fig. 8) of sheath and blade; the branches of the panicle have strongly thickened pulvini (Fig. 9); the first glume is 1-nerved, the second 3-nerved; the lemmas are tightly inrolled (Fig. 10) and more pilose at base than above, or quite glabrous in forma

glabriflorus Wieg.; and the palea is pulverulent on the back or only occasionally pilose. In *B. nottowayanus*, on the other hand, the lower and middle and usually all but the uppermost nodes are overtopped by the sheaths; the ligule is very short or scarcely visible above the rounded summit of the sheath (Fig. 2); the 1st glume is 1–3 nerved, the 2nd 5 (rarely 7)-nerved (Figs. 5 and 6); the lemmas (Figs. 4 and 5) are evenly strigosepilose over the back, their margins scarcely incurved; and the palea (Fig 7) is copiously pilose on the back.

In its prolonged sheaths and in its lemmas scarcely inrolled at margin Bromus nottowayanus is similar to B. latiglumis; but the two differ in many points. B. latiglumis has 10-20 cauline leaves; B. nottowayanus only 6-8. The base of the blade just above the junction with the sheath of B. latiglumis expands into a characteristic broad flange with a prolonged projection on each side (Fig. 11); B. nottowayanus has no such flange at the base of the blade (fig. 2). The bases of the panicle-branches in B. latiglumis have very large pulvini (Fig. 12), those of B. nottowayanus (fig. 3) being relatively slender. In B. latiglumis the 1st glume is 1-nerved, the 2nd 3-nerved; in B. nottowayanus 3-nerved and 5 (or 7)-nerved respectively. In B. latiglumis the lemmas are glabrous, or pubescent particularly at base; in B. nottowayanus evenly strigose-pilose all over. In B. latiglumis the palea is sometimes pilose but more often glabrous on the back; in B. nottowayanus apparently always pilose.

Bromus purgans is a relatively early-flowering species, B. latiglumis much later, B. nottowayanus intermediate between them in time of anthesis. The flowering material of the latter was collected in July, with belated culms flowering in August. In New England and New York B. purgans flowers from mid-June to mid-July, in Virginia from late May through June. In New England, New York, New Jersey and Pennsylvania B. latiglumis flowers from August 10 to mid-September; from Ohio and West Virginia westward, from mid-August to late September.

In plate 670, figs. 1–7 are of Bromus nottowayanus Fernald, all figures from the type; fig. 1, the type,  $\times$  %; fig. 2, summit of sheath,  $\times$  4; fig. 3, bases of branches of panicle,  $\times$  4; fig. 4, spikelet,  $\times$  2; fig. 5, glumes and base of lowest lemma,  $\times$  4; fig. 6, inner face of 2nd glume,  $\times$  4; fig. 7, floret, with palea exposed,  $\times$  4. Figs. 8–10, B. purgans L.: fig. 8, summit of sheath

(with ligule), × 4, from Milton, Massachusetts, July 31, 1899, Kennedy; Fig. 9, bases of panicle-branches, × 4, from Lansing, New York, A. J. Eames, no. 11,378; Fig. 10, portion of spikelet, showing inrolled lemmas, × 2, from no. 11,378. Figs. 11–13, B. Latiglumis (Scribn.) Hitchc.: Fig. 11, summit of sheath, × 4, from Beau Lac, St. Francis River, Maine, August 14, 1902, Eggleston & Fernald; Fig. 12, bases of panicle-branches, × 4, from Sheffield, Massachusetts, August 14, 1920, Churchill; Fig. 13, spikelet, × 2, from Ithaca, New York, F. P. Metcalf, no. 5828.

B. STERILIS L. DINWIDDIE COUNTY: waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 11,935. See p. 493.

Poa bulbosa L. Dinwiddle County: dry roadside and door-yard, Century House, northeast of Burgess, no. 11,743. Our

only station.

DISTICHLIS SPICATA (L.) Greene. Extending up the James to Surry County: fresh to brackish tidal marshes, Hog Island, no.

12,538. See p. 522.

DIPLACHNE MARITIMA Bicknell. Extending up the James to Surry County: fresh to brackish tidal marshes, Hog Island, no. 12,541; tidal marsh by Cobham Bay, James River, northwest of Chippokes, no. 12,540. See p. 522.

\*Elymus virginicus L., var. halophilus (Bicknell) Bush. Princess Anne County: marshes back of the dunes, Sand

Bridge, no. 12,246.

Extension south from New Jersey. See p. 512.

\*Lolium multiflorum Lam., forma submuticum (Mut.) Hayek. Henrico County: waste places and railroad ballast, Richmond, no. 12,251.

SPHENOPHOLIS OBTUSATA (Michx.) Scribn.

In eastern Virginia Sphenopholis obtusata occurs in three somewhat definite variations. These are clearly confluent but they have all been treated by competent students of grasses as three distinct species, by others (Hitchcock, Man.) as not worthy recognition even as forms. In sorting the material in the Gray Herbarium certain trends come to light, however, which indicate that each of the three has an area of geographic concentration and that in large areas of the United States one of them abounds to the exclusion or near exclusion of one or both of the others. I am, therefore, returning to Scribner's treatment of 1908¹ when he called them three varieties. I distinguish the three as follows.

<sup>&</sup>lt;sup>1</sup> Scribner in Robinson in Rhodora, x. 65 (1908).

Rhodora Plate 670

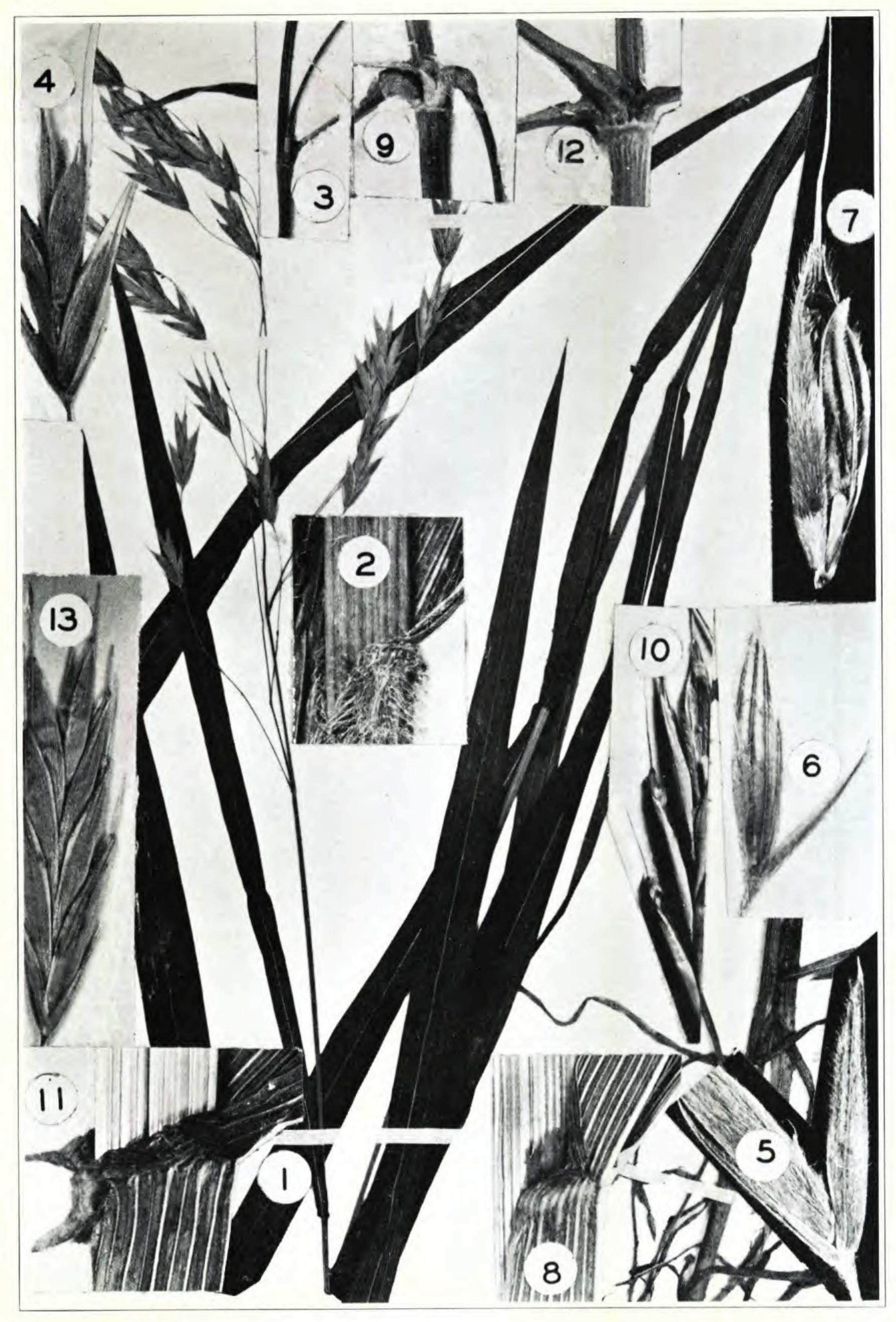


Photo. W. H. Hodge.

Bromus Nottowayanus: Fig. 1, habit,  $\times$  %; Fig. 2, summit of sheath,  $\times$  4; Fig. 3, bases of panicle-branches,  $\times$  4; Fig. 4, spikelet,  $\times$  2; Fig. 5, glumes and base of lemma,  $\times$  4; Fig. 6, inner face of 2d glume,  $\times$  4; Fig. 7, lemma and palea,  $\times$  4.

B. purgans: fig. 8, summit of sheath, × 4; fig. 9, bases of panicle-branches.

 $\times$  4; fig. 10, inrolled lemmas,  $\times$  4.

B. Latiglumis: fig. 11. summit of sheath,  $\times$  4; fig. 12, bases of panicle-branches,  $\times$  4; fig. 13. spikelet,  $\times$  2.

a. Panicle 0.7–2 dm. long, up to 3 cm. thick, its branches irregularly elongate and not strongly appressed and rounded at summit. Leaves or their sheaths glabrous or merely scabrous

Taking as a check the representation in the Gray Herbarium, where, with no specialization upon the grasses, the average run of collections has accumulated, I note the following trends. Typical Sphenopholis obtusata is irregularly dispersed over the eastern half of the United States, from Maine to southern Ontario, Minnesota and eastern Nebraska southward. There are no specimens from the Cordilleran region (Alberta to New Mexico and westward), while from Virginia to Georgia there are only 10 specimens as against 27 from New England to North Dakota, Nebraska and eastern Kansas. Var. pubescens is not at all represented from northern New England westward, but from southern New England southward to Florida, thence to Louisiana and Missouri, there are 38 sheets, this variety showing a concentration on the Coastal Plain and outer Piedmont. Var. lobata has the broadest range, but it is the only variety represented from Alberta to New Mexico, thence west to the Pacific (27 sheets), with marked development from North Dakota to Oklahoma and northeast to northern New England (31 sheets as against 0 of var. pubescens). From the Coastal Plain area, whence var. pubescens is represented by 38 sheets, var. lobata shows only 8. If other herbaria were studied these figures would be greatly increased, but it is doubtful if their trend would be greatly changed.

In southeastern Virginia all three varieties occur.

\*Sphenopholis obtusata (Michx.) Scribn. (typical): Dinwiddle County: waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 11,946. Presumably an adventive. See p. 493.

S. OBTUSATA, Var. PUBESCENS (Scribn. & Merr.) Scribn. (Eatonia pubescens Scribn. & Merr.). Many nos. from Accomac, Henrico, Norfolk and Greensville Counties. Old specimens from Richmond and from Bedford County annotated by Scribner, with the comment that "This is the more common form of Eatonia obtusata in the South." See p. 493.

\*S. obtusata, var. lobata (Trin.) Scribn. (Trisetum lobatum Trin.) Princess Anne County: swale by Nowney Creek, Back Bay, no. 4552. Isle of Wight County: thickets and open woods back of the beach of James River west of Fort Boykin, no. 12,933. Sussex County: clearings, borders of dry woods and roadsides east of Stony Creek, no. 8047...

\*S. FILIFORMIS (Chapm.) Scribn. NANSEMOND COUNTY: white sand of pine and oak woods and clearings near Cathole Landing, west of Factory Hill, no. 11,747.

First from north of North Carolina. See p. 490.

\*S. PALLENS (Spreng.) Scribn. Southampton County: rich wooded slopes and spring-heads along Nottoway River, above Carey Bridge, no. 11,945.

First except for an indefinite station in South Carolina and the unidentified station for the type. See p. 494; also Rhodora, xlii. 357 (1940).

AIRA PRAECOX L. SURRY COUNTY: weed in lawn, Surry Courthouse, no. 11,749. Princess Anne County: sandy open ground near sea, Virginia Beach, B. L. Robinson, no. 424.

Certainly a local plant in Virginia. See p. 488.

A. CARYOPHYLLEA L. NORFOLK COUNTY: Norfolk, Heller, no. 857. Dinwiddle County: dry pastured field east of Burgess Station, no. 11,947.

Much less common than A. capillaris Host. Several collections of the latter have unfortunately been distributed as A. caryophyllea, this misidentification resulting, in part, from the statement by Hitchcock in Gray's Man. ed. 7, that the spikelets of A. capillaris are "2.5 mm. long". Measurements of spikelets and reference to European descriptions indicate that they are 1.5- rarely 2 mm. in length, while those of A. caryophyllea range from 2.5 to 3 mm.

Polypogon monspeliensis (L.) Desv. Range extended up the James to Isle of Wight County: seeping argillaceous and calcareous bluffs along Burwell Bay, below Rushmere (Fergusson's Wharf), no. 12,547. See p. 524.

\*Agrostis stolonifera L. Isle of Wight County: open bushy margin of Lee's Millpond, no. 12,252. Nansemond County: roadside bank south of Nurney, no. 12,936. Seen in

several other counties.

Not recorded by Hitchcock (Man.) from south of New Jersey.

\*A. STOLONIFERA, Var. COMPACTA Hartm. (A. palustris Huds., A. maritima Lam.). Surry County: sandy tidal shore of Crouch Creek, east of Scotland, no. 8547.

First from south of Delaware and Maryland.

\*A. TENUIS Sibth. PRINCESS ANNE COUNTY: swales back of the dunes, Sand Bridge, no. 4548.

Hitchcock (Man.) says "south to Maryland, West Virginia and Michigan", although his map shows a dot squarely in the center of Virginia and another in western North Carolina. The two southern dots were evidently based upon var. aristata (Parn.) Druce, which Hitchcock records as occurring south to North Carolina.

A. Elliottiana Schultes. Local range extended north to Sussex County: argillaceous fallow field south of Stony Creek, no. 11,750. See p. 491.

Aristida lanosa Muhl. Inland range extended north into Sussex County: dry white sand of woods and clearings near

Chub, no. 12,548.

Spartina alterniflora Loisel., var. glabra (Muhl.) Fern. Extending up the James to Surry County: fresh to brackish tidal marshes, Hog Island, no. 12,549. See p. 522.

ZIZANIOPSIS MILIACEA (Michx.) Döll. & Aschers. Extending to the head of tide on the James, in Henrico County: margin

of a canal, Richmond, no. 11,952. See p. 495.

Late in the season the culms may fork from the upper nodes, producing stout branches (our no. 12,550 from west of Claremont).

\*Echinochloa crus-pavonis (HBK.) Schultes. Fresh tidal marshes of Mattaponi River, wholly or nearly immersed at high tide. King and Queen County: Walkerton, no. 12,557. King William County: northwest of King William Courthouse, no. 12,556; Horse Landing, near King William Courthouse, no. 12,555. Extension northward from Alabama. See p. 527.

Echinochloa crus-pavonis, an aquatic and very smooth species with flaccid leaves, elongate and loosely open panicle of relatively smoothish spikelets, has been known as a plant of tropical America (South America, West Indies and Mexico). In his Manual Hitchcock records it only from "marshes and wet places, often in water, Alabama, southern Texas, and through tropical America at low altitudes." Its abundance in the estuary of

the Mattaponi is another instance of the tropical types persisting, far north of their more continuous areas, in estuaries, a situation discussed in some detail by me in Rhodora, xlii. 504 et seq. (1940). In the Mattaponi *E. crus-pavonis* is isolated by nearly 800 miles from its stations in southern Alabama.

E. Walteri (Pursh) Heller, forma breviseta Fern. & Griscom in Rhodora, xxxvii. 137 (1935). Originally described from North Landing River, Norfolk Co. Now known from Isle of Wight County: brackish marsh along Cypress Creek, Smithfield, no. 8949 (distrib. as *E. Walteri*); border of salt marsh, Ragged Island, northeast of Carrollton, no. 12,561.

With the dense inflorescence of typical Echinochloa Walteri but with awns only 3.5–4.5 mm. long (exceptionally with a few longer ones), the panicle green in all three colonies (instead of purple), the sheaths scabrous but scarcely strigose-hispid.

EULALIA VIMINEA (Trin.) Kuntze. To the original Virginian station of Blake at City Point, Prince George County, reported in Rhodora, xxxvi. 420 (1934) add an extensive one in Greens-ville County: roadside bordering rich woods by Three Creek, northwest of Emporia, no. 12,564. See p. 518.

The City Point station persists but is likely to be exterminated. The new one shows every indication that the plant will spread. City Point is translated in Hitchcock's Manual into "near Richmond"; but Richmond and City Point are in different counties and farther apart than are Washington and Brandywine or the Patuxent River, Rockville, Fairfax or Accotink. We have no evidence that *Eulalia* is in Richmond, where, on account of the record, many hours have been spent in fruitless search for it.

ARTHRAXON HISPIDUS (Thunb.) Makino, var. CRYPTATHERUS (Hackel) Honda. Rapidly spreading; new stations in southern Sussex and Greensville Counties. See p. 518.

Andropogon virginicus L., var. glaucus (Muhl.) Hackel. Range extended northward into Isle of Wight County: moist sandy and peaty pine barrens, south of Lee's Mill, no. 12,568. See p. 519.

\*Cyperus refractus Engelm. Southampton County: bushy swales and borders of swampy woods near Blackwater River, Cobb's Wherf no 10.057

Cobb's Wharf, no. 10,957.

An inland species, heretofore known in the upland of Penn-

sylvania, Maryland, District of Columbia and from western North Carolina and Georgia, and westward.

C. Grayii Torr. Occurring only near the coast (on dunes, in dune-hollows, etc., close to the sea) at the northern end of its range (in New England), C. Grayii in the South pushes back to the "fall-line sand hills". The inland stations in southeastern Virginia are the following. ISLE OF WIGHT COUNTY: dry sandy pine barrens south of Zuni, no. 6525; white sand of dry woods and clearings east of Joyner's Bridge, no. 12,265. NANSEMOND County: white sand of pine barrens, southwest of South Quay, no. 10,136; dry white sand of pine barrens, east of Cox Landing, south of South Quay, no. 10,536; white sand of pine barrens, east of Cherry Grove, south of South Quay, nos. 10,534 and 10,535. Southampton County: white sand of pine and oak woods southeast of Wiggins School, south of Franklin, no. 11,265; dry sand, pine barrens about 7 miles south of Franklin, nos. 7326 (large) and 7326a (dwarf); dry white sand in oak and pine woods and clearings bordering Assamoosick Swamp, south of Sebrell, no. 10,135; dry white sand in woods, Terrapin Ridge, east of Drewryville, no. 8971.

Through my own stupidity many of these numbers were hastily identified as Cyperus filiculmis var. oblitus Fern. & Griscom. The two are very different. C. filiculmis Vahl has scabrous-margined flat (or folded) leaves and involucres; scales of the spikelets with broad hyaline margins, the terminal scales ending in involute or subulate tips, the rachilla wingless or only narrowly winged and the style 3-cleft nearly to base. C. Grayii, on the other hand, has smooth, filiform or filiform-conduplicate leaves and involucres; scales narrow-margined, the midrib not at all prolonged to form slender tips, the rachilla broadly winged, and the style 3-cleft to the middle. Only through my association of C. Grayii with coastal sands can I explain my inexcusable misidentifications of it.

\*C. ovularis (Michx.) Torr., var. sphaericus Boeckl. Elizabeth City County: Hampton, July 15, 1891, A. B. Seymour, no. 8.

Although Britton in Bull. Torr. Bot. Cl. xiii. 215 (1886) cited var. sphaericus only from Arkansas, Indian Territory (Oklahoma) and Texas, and Kükenthal adds to the range only Louisiana (type-locality) and Georgia, the variety seems to be a fairly defined one, extending northward to Virginia and into

southern Ohio (Vinton, Gallia Co., July 1901, Kellerman) southern Indiana (Daviess Co., Deam, no. 17,101) and Missouri (Sheffield, Bush, no. 41). The Seymour specimen is a close match for an isotype, from Drummond's Louisiana material. Typical Cyperus ovularis has the usually flat basal and involucral leaves 3–10 mm. long, the longest involucral leaf 1.2–4.5 dm. long; spikes globose-ellipsoid, definitely longer than thick, in maturity 1–2.3 cm. long and 0.8–1.8 cm. thick. Var. sphaericus is smaller and more slender, with firmer and more folded leaves only 1.5–5 mm. wide, the longest involucral leaf usually 0.5–1.5 dm. long; the exactly spherical heads few (1–5) and only 7–12 mm. in diameter.

\*C. Retrorsus Chapm. Accomac County: clearing in pine woods 3½ miles north of Accomac, no. 5231. Princess Anne County: wet depression in pine barrens, Cape Henry, Fernald & Griscom, no. 2791. Sussex County: sandy open woods, thickets and clearings by Nottoway River, below Peter's Bridge, southeast of Lumberton, no. 12,263. Southampton County: dry sand, pine barrens about 7 miles south of Franklin, no. 7323. Mostly distributed as var. cylindricus (Ell.) Fern. & Grisc.

When Griscom and I studied the variations of Cyperus retrorsus—see Rhodora, xxxvii. 152, 153 and plate 342 (1935)—we did not recognize typical C. retrorsus, with slenderly cylindric spikes bearing crowded small retrorse spikelets at base, these closely appressed to or parallel with the summit of the ray, from north of South Carolina. The typical form of the species reaches southern New Jersey.

Bulbostylis ciliatifolius (Ell.) Fernald. Range extended northward and northeastward. Sussex County: dry white sand of woods and clearings near Chub, no. 12,582. Isle of Wight County: white sand of dry pine barrens, south of Lee's Mill, no. 12,578; white sand of dry woods and clearings east of Joyner's Bridge, no. 12,267. See pp. 506 and 514.

\*B. COARCTATUS (Ell.) Fern. Sussex County: dry white sand of woods and clearings near Chub, nos. 12,579 and 12,581; Southampton County: dry sandy woods and clearings north-

east of Cypress Bridge, no. 12,580. See p. 518.

Extension north from North Carolina.

Scirpus lineatus Michx. York County: old-field swale north of Grafton, no. 11,982. See p. 504.

Collected by Grimes near Williamsburg. Very local on the Coastal Plain.

\*Rhynchospora Grayii Kunth. Norfolk County: Norfolk, Reed, old specimen in Herb. Phil. Acad.

Extension north from southeastern North Carolina.

\*Scleria flaccida Steud. Syn. Pl. Cyp. 174 (1855). Norfolk County: peaty clearing, Great Dismal Swamp, north of Yadkin, no. 12,274. First from north of South Carolina. See p. 512.

In Rhodora, xxxviii. 397, 398, pl. 444 (1936), I pointed out three species which had been confused by Core in his American Species of Scleria, Brittonia, ii. 63 (1936), as S. triglomerata Michx. These were there sufficiently discussed and illustrated by me, except that a character in the hypogynium or basal disk supporting the achene was not then emphasized. True S. triglomerata is a relatively coarse plant with depressed-globose achenes 2-2.5 mm. high and 2-2.7 mm. broad, nearly glabrous band on the ventral side of the leaf-sheath, and with a knotty, forking rhizome. It occurs in damp to slightly dry soils from eastern Massachusetts to southern Ohio, Wisconsin and Iowa, south to Florida, Alabama, Mississippi, Louisiana and Texas. S. minor (Britton) Stone is a very slender species, with achenes only 1-1.8 mm. high and 1-1.8 mm. broad, inhabiting peaty and boggy places from southern New Jersey to South Carolina. S. nitida Willd., with usually elongate and straightish rhizomes or branches of the rhizome, culms erect or strongly ascending and terminated by the inflorescence, without lateral branches, and membranous band of the leaf-sheath pubescent, has ovoid achenes longer than thick (2.8-3.3 mm. long, 2-2.8 mm. broad), S. nitida growing principally in dry sands of pinelands and barrens, from New Jersey to Georgia and southern Kentucky.

The plant (no. 12,274) found by us at the northern margin of the Great Dismal Swamp at once challenged attention: it is cespitose, making tussocks, with arching culms bearing capillary lateral branches much as in Scleria setacea Poir.; but its sheaths are much as in S. nitida, while its lustrous white to buff achenes are more slenderly ovoid. Study of the material shows a very striking difference in the hypogynium. In S. nitida of the pine barrens the latter is tuberculate with low rounded pebbling;

in the cespitose and more flexuous and branching plant the hypogynium has the tubercles prolonged into lance-acuminate scale-like blades. Study of all the material in the Gray Herbarium shows the Dismal Swamp plant with branching and flexuous culms and elongate achenes resting upon a hypogynium with lance-acuminate laminate tubercles to occur from Florida to Louisiana. Although the Virginia material is more slender and with narrower leaves than in the Florida plant, some of the Mississippi material and that from Louisiana is quite as slender as ours.

Since a species with so broad a range is unlikely to have been overlooked, although the plant of Florida and Mississippi, along with S. nitida and S. minor, was identified by Core with S. triglomerata, I have checked the original descriptions of the species thus merged by him and there seems no doubt that the cespitose plant with pubescent band on the leaf-sheath, axillary and finally prolonged and flexuous or nodding branches, slenderly ovoid achenes and laminate-tuberculate hypogynia is S. flaccida Steudel. Steudel clearly distinguished his new S. flaccida from the stiffer and unbranched S. nitida as follows (italics mine):

"76. S. NITIDA. Willd. (ex Kunth. 1. c. [Enum. ii.] 350.) . . . achenio lapideo ovato-subgloboso umbonato laevi lacteo-candido nitido, ad basin margine tumido trigono subtilissimo celluloso-papilloso cincto." "77. S. FLACCIDA. Steud. Culmo tenui triquetro vix scabriusculo (2-3-pedali) flaccido, vaginis arctis simpliciter triquetris (angulis non membranaceis nec alatis); ligula brevi; spicis versus apicem caulis subcapitatis paucifloris parum remotis; spiculis androgynis masculis intermixtis; achenio ovato-suborbiculato fragili nitido lacteo laevissimo basi margine inciso celluloso-papilloso cincto; stipite brevissimo. A praecedente, cui quoad discum similis pluribus notis diversa. M. Curtis legit in Carolina austr."

As above stated, I have seen no material but ours of Scleria flaccida from north of Florida and the Gulf States; but since the plant is in the Great Dismal Swamp of Virginia (and, therefore, presumably in North Carolina) there seems every reason to believe that the species which Steudel had from South Carolina with "achenio . . . basi margine inciso celluloso-papilloso cincto" is our plant. As also noted, S. flaccida prefers wet, peaty soil, S. nitida dry sand, though the two are apparently not restricted to these habitats. When I showed the material

from the Great Dismal Swamp to Dr. D. S. Correll he promptly went to his Louisiana material and brought me a sheet quite like our no. 12,274, with an apology for its lack of base. It grew in an inundated gum-swamp where the muck was so deep that he could reach only the culms by creeping out on a floating log. That is not the habit of S. nitida nor of S. triglomerata. It may be of service to others to have the material of these two species cited. I am, therefore, listing specimens seen from south and west of Virginia.

S. NITIDA. NORTH CAROLINA: dry sterile soil, southeast of Granite Falls, Caldwell Co., L. F. & F. R. Randolph, no. 1063; dry woods, Columbus, Polk Co., Peattie, no. 1086: pineland near Lilington, Harnett Co., Godfrey, no. 5648; savannah at Richlands, Onslow Co., Godfrey, no. 4471. South Carolina: sandridge west of Paxville, Clarendon Co., Godfrey & Tryon, no. 1017; open white-sandy oak-pine woods east of Eutawville, Orangeburg Co., Godfrey & Tryon, no. 822; pine barren west of Pineville, Berkeley Co., Godfrey & Tryon, no. 614. Georgia: dry woods, summit of Chattoogata Mts., Whitfield Co., Harper, no. 268; dry pine woods near Belair, Richmond Co., Harper, no. 1316; sandy soil, Sumter Co., June 17, 1897, Harper. Kentucky: dry bank, between New Concord and Tennessee State Line, Calloway Co., Smith & Hodgon, no. 4096.

S. FLACCIDA. FLORIDA: oak woods and thickets, Duval Co., Curtiss, no. 3179; hummock, Duval Co., Fredholm, no. 5167; sandy oak woods by salt water, Jacksonville, Wiegand & Manning, no. 649; Eustis, Lake Co., Nash, no. 316; sand-barrens, Hillsboro River, Tampa, April 9, 1893, Churchill: Clearwater, Tracy, no. 6965; Miami, Tracy, no. 9288; Everglades, Dade Co., A. A. Eaton, no. 341a; old field, Alva, Lee Co., Hitchcock, no. 431. Mississippi: Biloxi, Tracy, no. 4805; Avondale, March 31, 1898, Tracy. Louisiana: without stated locality, Hale; in tupelo swamp, 3 miles northeast of Franklinton, Washington Parish, D. S. & H. B. Correll, no. 9200.

\*Carex Leavenworthii Dewey. Prince George County: disturbed soil of roadside, rich wooded slopes by James River, Indian Point, no. 11,761. Dinwiddle County: border of woods in cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 11,994. Surry County: weed in lawn, Surry Courthouse, no. 11,762. Isle of Wight County: in turf under trees by Benns Church, no. 11,995. See pp. 488 and 493.

Not cited from Virginia by Mackenzie in N. Am. Fl.

C. virginiana (Fernald), stat. nov. C. crus-corvi, var. virginiana Fernald in Rhodora, xxxix. 393, pl. 476, figs. 1-5 (1937).

To the several characters distinguishing the plant of bottomlands of the Meherrin and Nottoway systems in southeastern Virginia from Carex crus-corvi Shuttlew. of the Mississippi Basin and drainage area of the Gulf of Mexico should be added longer styles and shorter-cleft beaks of the perigynia. With so many characters and so complete isolation C. virginiana is better treated as a separate species, although obviously derived from the same ancestral stock as C. crus-corvi. On the bottomlands of the Meherrin, northeast of Gaskins, in Greensville County, the panicles reach a length of 2.1 dm. (our no. 12,953).<sup>1</sup>

\*C. CONJUNCTA Boott. DINWIDDIE COUNTY: wooded bottom-land of Appomattox River below Petersburg, nos. 11,996 and 11,997. Henrico County: bottomland woods and thickets along James River, west of Varina, no. 11,998.

First known in the Atlantic States from south of the District of Columbia. See pp. 492 and 495.

\*C. Decomposita Muhl. James City County: swamp along side of creek, 1 mile southwest of Williamsburg, Grimes, no. 3925. Isle of Wight County: cypress and gum swamp back of beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), nos. 12,597 and 12,951; similar habitat, Bailey's Beach (MacKimmie's Wharf), near Rushmere, nos. 12,598, 12,949 and 12,950. See p. 525.

The material, over-ripe and apparently not quite typical, collected in late August of 1940, seemed distinguishable from the

<sup>1</sup> Carex virginiana has been recorded only from Greensville and Southampton Counties, Virginia, where it abounds on rich bottomlands of rivers entering the sea in North Carolina. It is, therefore, significant that in the Gray Herbarium I find in the cover of C. stipata Muhl., var. uberior C. Mohr or C. uberior (C. Mohr) Mackenzie a very characteristic but wholly immature specimen of C. virginiana from river-swamp, Waccamaw River, below Longwood Landing, Horry County, South Carolina, April 22, 1932, Weatherby & Griscom, no. 16,441. In their report of it, as C. stipata, var. uberior, the collectors discriminatingly said: "In the last collection, kindly determined for us by Mr. Mackenzie, the leaves are deep bluish-green and the very young panicle almost as open and branched as in species of the section Indocarex, which superficially the specimens much resemble".— Weatherby & Griscom, Rhodora, xxxvi. 39 (1934). Carex stipata, var. uberior has yellowishgreen, flaccid leaves, with the cross-puckered membranous band of the sheath friable, very thin and prolonged at summit, the spiciform panicle dense and, to quote Mackenzie, "4-10 cm. long". Weatherby & Griscom's no. 16,441 not only has the firm and heavily glaucous foliage and the firm veinless and unpuckered band of the leaf-sheath concave at summit, as in C. virginiana; its quite immature (not even flowering), lax panicle is more than 2 dm. long and in maturity would easily reach a length of 2.5 dm. It is most difficult to understand how it could originally have been identified by Mackenzie with his C. uberior.

chiefly continental *C. decomposita*, but fresh material secured in June, 1941, shows that the supposed differences do not hold. The species is primarily of the Mississippi drainage and of the Coastal Plain of the Gulf of Mexico, Mackenzie (N. Am. Fl.) citing it only from western New York, Maryland (near Great Falls of the Potomac), Ohio, Michigan, Indiana, Missouri, Arkansas, Louisiana, Alabama and Florida. Although Mackenzie did not know the species from North Carolina, it occurs in the region of Wilmington: base of cypress tree, Greenfield Lake at Wilmington, *Godfrey & Wells*, no. 4789. In the two cypress swamps of Isle of Wight County the species roots chiefly upon cypress-bases and -knees, its roots hanging down into the water.

\*C. CANESCENS L., var. DISJUNCTA Fernald. PRINCESS ANNE COUNTY: swampy pools near Dam Neck, Fernald & Griscom, no. 4317. Isle of Wight County: cypress swamp back of sandbeach of Burwell's Bay, James River, at Bailey's Beach (Mac-Kimmie's Wharf), near Rushmere (Fergusson's Wharf), no. 12,956. Henrico County: sphagnous bog bordering White Oak Swamp, west of Elko Station, no. 11,991.

Extension south from Maryland. See p. 497.

\*C. TENERA Dewey. Henrico County: rich wooded slopes by James River, west of Varina, no. 11,985. Sussex County: bottomland woods by Nottoway River, east of Huske, no. 12,958.

Not seen by Mackenzie from Virginia. See p. 495.

C. NORMALIS Mackenzie. Henrico County: bottomland woods and thickets along James River, west of Varina, no. 11,986. Sussex County: bottomland woods along Nottoway River, east of Huske, no. 12,961.

Our first stations on the Coastal Plain of Virginia. See p. 495.

\*C. RENIFORMIS (Bailey) Small. Southampton County: small cypress swamp in sandy woods and clearings by Nottoway River, near Carey Bridge, nos. 11,989 and 12,277.

Extension north from South Carolina. See p. 494 and MAP 2.

C. Jamesh Schwein. To the single known Virginia station in Surry County add one in Prince George County: rich wooded slopes by James River, Indian Point, no. 11,768. See pp. 488 and 520.

\*C. TETANICA Schkuhr. Sussex County: alluvial woods along Nottoway River at Readjuster Bridge, south of Peanut, no.

12,014.

First in Atlantic States from south of the region of Washington. See p. 501 and MAP 4.

C. DIGITALIS Willd. Surry County: rich wooded ravines near James River, west of Ingersoll, no. 11,794; steep calcareous wooded bluffs along James River, above Chippokes, no. 12,976.

Our first stations on the Coastal Plain of Virginia where the species is largely represented by var. Macropoda Fernald in Rhodora, xl. 400, t. 511, figs. 3 and 4 (1938).

\*Carex digitalis Willd., var. asymmetrica, var. nov., perigyniis lanceolato-fusiformibus 3–4 mm. longis obsolete angulatis valde curvatis apice prolongatis.—Virginia: steep wooded banks, ravines and clearings near Three Creek, northwest of Applewhite's Church, Southampton County, May 8, 1940, Fernald & Long, no. 11,791 (Type in Herb. Gray; isotype in Herb. Phil. Acad.), June 5, 1940, no. 12,013; about 3 miles from North Carolina line, Henry County, May 6, 1939, J. T. Baldwin, jr., no. 232. Georgia: rich woods along Rocky Creek, 5 miles west of Waynesboro, Burke County, March 30, 1904, Harper, no. 2076. Florida: moderately damp rich woods about two miles east-southeast of Tallahassee, Leon County, at 5:35 p. m., April 26, 1925, Harper no. 32. See p. 489.

Typical Carex digitalis has the rhombic-ovoid, definitely angled and flat-faced perigynia nearly symmetrical or only slightly oblique at the short and scarcely beaked summit and mostly 2.5–3 mm. long. In var. asymmetrica of the South the perigynia are lance-fusiform, obscurely angled, 3–4 mm. long and tapering on one side by a long curve to the tip, thus giving a long-beaked appearance. I have sought in vain for other characters; the plants are in other respects very close to typical  $C.\ digitalis$ .

C. CREBRIFLORA Wiegand. To the first recorded Virginia station, in Southampton County, add the following. Greensville County: bottomland woods, Meherrin River, northeast of Gaskins, no. 12,962. Southampton County: rich wooded slopes and spring-heads along Nottoway River, above Carey Bridge, no. 12,009; sandy woods and clearings near Carey Bridge, no. 12,010. Nansemond County: wooded bottomland of a branch near Cathole Landing, west of Factory Hill, no. 11,785. Sussex County: alluvial bottomland woods along Nottoway River, west of Homeville, no. 12,008. Surry County: bottomland woods along Blackwater River, about 1 mile southwest of Dendron, no. 12,963.

Rhodora Plate 671

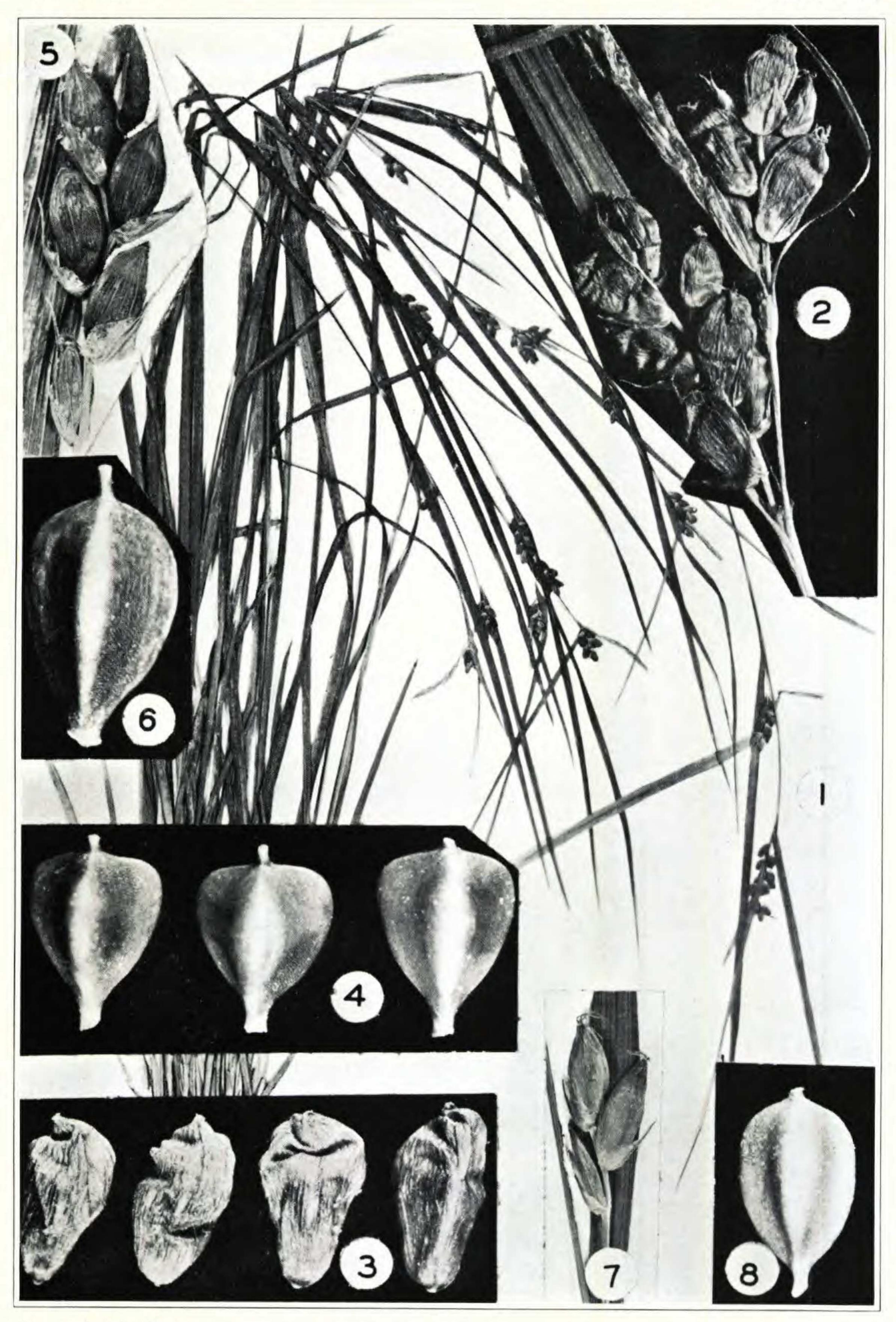


Photo. W. H. Hodge.

Carex rugata: fig. 1, habit, × ½; fig. 2, inflorescence, × 3; fig. 3, perigynia. × 5; fig. 4, achenes, × 10.
C. grisea: fig. 5, pistillate spike, × 3; fig. 6, achene, × 10.
C. amphibola: fig. 7, pistillate spike, × 3; fig. 8, achene, × 10.

C. OLIGOCARPA Schkuhr. Surry County: low woods along Gray's Creek, near Old Courthouse Corners, no. 8624.

Our first station on the Coastal Plain of Virginia.

C. AMPHIBOLA Steud. To the original Virginia stations, recorded in 1939 for Surry and Dinwiddie Counties, add many others in these and in Prince George, Sussex, Southampton and Greensville Counties.

\*Carex rugata, sp. nov. (tab. 671, fig. 1-4), C. grisea habitu simillima; foliis viridibus; perigyniis inflatis ellipsoideo-oblongis plus minusve transverse rugatis apice rotundatis vel rotundo-obliquis; achaeniis truncato-obovoideis 2-2.5 mm. longis, 1.8-2 mm. latis basi subcuneatis stipitatis.—Alluvial or bottomland woods of Nottoway River, southeastern Virginia: Sussex County: west of Homeville, May 7, 1940, Fernald & Long, no. 11,787 (type in Herb. Gray; isotype in Herb. Phil. Acad.), June 5, 1940, Fernald & Long, no. 12,004 (topotype); southwest of Burt, July 25, 1936, Fernald & Long, no. 6110, April 3, 1938, Fernald & Long, no. 7783; by Nottoway River, May 20, 1939, J. T. Baldwin, Jr., nos. 277, 279 and 281. Southampton County: near Courtland, June 23, 1936, Fernald, Long & Smart, no. 5679; above Cypress Bridge, July 23, 1936, Fernald & Long, no. 6109. See p. 486.

Carex rugata has troubled us in the field for five years. It is so close to C. grisea Wahlenb. that it would readily pass as that species, for C. grisea may be far from griseous in color and its perigynia (Fig. 5) are sometimes puckered. The plant along the lower Nottoway is almost ubiquitous, occupying extensive areas of wooded bottom, and every time we get into a good colony we feel that it can hardly be crowded into C. grisea, for the perigynia (Figs. 2 and 3) are less definitely tipped and always with cross-wrinkling or puckering. The achenes are very different: in C. grisea (Fig. 6) somewhat ellipsoid-obovoid, with summit gradually rounded to the style-base, whereas the achenes (Fig. 4) of C. rugata are broadly cuneate-obovoid with truncate summit. The achenes of C. grisea are so closely invested by the perigynia that some effort and scraping are required to separate them; those of C. rugata are so free from the perigynia that a slight rolling of the latter promptly frees the achene. The perigynium is, obviously, readily puckered on account of this "fullness".

In outline the achene of Carex rugata somewhat approaches

that of *C. amphibola* Steud. (Fig. 8) but the latter is more rounded at summit and the perigynia (Fig. 7) are prolonged into straight subrostrate tips. Furthermore, the basal sheaths of *C. amphibola* are purple, in *C. rugata* drab.

In plate 671 figs. 1–4 are of Carex rugata Fernald: fig. 1, habit, × ½, from type; fig. 2, inflorescences, × 3, from type; fig. 3, perigynia, × 5, from topotype; fig. 4, mature achenes, × 10, from topotype. Figs. 5 and 6, C. grisea Wahlenb.: fig. 5, pistillate spike, × 3, from Middlebury, Vermont, June 22, 1878, Brainerd; fig. 6, mature achene, × 10, from the latter collection. Figs. 7 and 8, C. amphibola Steud.: fig. 7, pistillate spike, × 3, from east of Burgess Station, Dinwiddie County, Virginia, Fernald & Long, no. 9873; fig. 8, ripe achene, × 10, from no. 9873.

C. GRACILLIMA Schwein. To the only Virginian Coastal Plain station recorded (in Dinwiddie County) add the following. Prince George County: swampy bottomland woods along James River, Indian Point, no. 11,766. Greensville County: alluvial bottom by Three Creek, northwest of Emporia, no. 11,767.

C. Prasina Wahlenb. Surry County: spring-heads, rich wooded ravines west of Claremont, no. 11,771; spring-heads and brook-sides, rich wooded ravines near James River, west

of Ingersoll, no. 11,772. See pp. 488 and 521.

A northern and montane species; our first recorded from the Coastal Plain.

C. Debilis Michx., var. Rudgei Bailey (C. flexuosa Muhl.). Sussex County: brookside in pine woods by Nottoway River, west of Lamb's no. 12,965. Southampton County: wet swampy clearing at head of rich wooded ravine, Nottoway River, near Davis School, northwest of Courtland, no. 11,764. Greensville County: alluvial bottom by Three Creek slightly above the "fall-line", northwest of Emporia, no. 11,765.

An upland plant; our first stations on and near the Coastal Plain.

\*C. Lanuginosa Michx. Sussex County: swales and wet thickets south of Stony Creek, nos. 11,797 and 12,024.

First in the Atlantic States from south of the District of Columbia. See p. 491.

C. Emoryi Dewey. King and Queen County: fresh tidal marsh of Mattaponi River, Walkerton, no. 12,599.

Our first station in eastern Virginia.

C. MITCHELLIANA M. A. Curtis. York County: margin of rill in rich wooded ravine by York River, above Yorktown, no.

12,003. ISLE OF WIGHT COUNTY: cypress swamp back of sand-beach of Burwell's Bay, James River, at Bailey's Beach (Mac-kimmie's Wharf), near Rushmere (Fergusson's Wharf), no. 12,978; similar habitat, below Rushmere, no. 12,979; seen in other cypress swamps along the James.

\*C. Lurida  $\times$  squarrosa. With C. lurida Wahlenb. and C. squarrosa L. and clearly combining their characters. Sussex County: alluvial woods along Nottoway River at Readjuster

Bridge, south of Peanut, no. 12,028. See p. 501.

\*Arisaema triphyllum (L.) Schott, var. acuminatum (Small) Engler (A. acuminatum (Small). Sussex County: swampy woods northeast of Homeville, no. 12,031.

Small (Man.) restricts his Arisaema acuminatum to northern Florida, but says "Forms with the spathe-blade moderately long-acuminate occur in the Coastal Plain as far up as SE Va., and may represent this species". Whether they are anything but extremely large developments of A. triphyllum is very doubtful.

A. Dracontium (L.) Schott. To the station already reported in Southampton County add others in Sussex County: open woods along Nottoway River at Peters Bridge, no. 12,032; bottomland of Nottoway River, southeast of Stony Creek, no. 12,280.

Symplocarpus foetidus (L.) Nutt. To the very few stations on the Coastal Plain add one in Charles City County: springhead in ravine, margin of Chickahominy River, Eagle Bottom, no. 11,656. See p. 486.

Wolffia Punctata Griseb. To the few recorded stations add the following. Isle of Wight County: cypress swamp back of sand-beach of Burwell's Bay, James River, at Bailey's Beach (MacKimmie's Wharf), near Rushmere (Fergusson's Wharf), no. 12,601. King William County: pond confluent with fresh tidal marsh of Pamunkey River, Sweet Hall, no. 12,602.

ERIOCAULON PARKERI Robinson. Local range extended to King and Queen County: fresh tidal marsh of Mattaponi River,

Walkerton, no. 12,604.

Tradescantia virginiana L. Henrico County: embankments and cinders of Chesapeake and Ohio Railroad, west of Elko Station, no. 12,033. See p. 497.

Anderson & Woodson cite no material from the Coastal Plain.

T. CANALICULATA Raf. Sussex County: open woods along Nottoway River at Peters Bridge, no. 12,034. Identified by Dr. Edgar Anderson.

Anderson & Woodson cite and map no Coastal Plain station in Virginia, but many such from Florida to southeastern North Carolina. See p. 499.

TILLANDSIA USNEOIDES L. Local range extended inland to northwestern Isle of Wight County: high in trees at border of cypress and gum swamp back of beach at Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,609. See p. 526.

Juncus bufonius L. To the very limited stations in south-eastern Virginia add one in Princess Anne County: marshes

back of the dunes, Sand Bridge, no. 12,286. See p. 512.

J. EFFUSUS L., var. costulatus Fernald. Local range extended inland. Norfolk County: wet, peaty clearings in woods of *Pinus serotina*, south of Grassfield, no. 12,037. Nansemond County: sandy and sphagnous margins of thickets in pineland southwest of Marsh Hill School, south of South Quay, no. 12,290.

J. Roemerianus Scheele. Extending up the James to Surry County: fresh to brackish tidal marshes, Hog Island, no. 12,610.

See p. 522.

J. ABORTIVUS Chapm. To the two areas already recorded add another in Isle of Wight County: very abundant in moist sandy and peaty pine barrens, south of Lee's Mill, no. 12,611. See p. 519.

J. DIFFUSISSIMUS Buckl. Local range extended into Greens-ville County: argillaceous clearing in swampy woods near Readjuster Bridge over Nottoway River, northeast of Orion, no.

12,039. See p. 500.

Tofieldia racemosa (Walt.) BSP. To the stations in adjacent counties add one in Isle of Wight County: moist sandy and peaty pine barrens, south of Lee's Mill, no. 12,294.

AMIANTHIUM MUSCAETOXICUM (Walt.) Gray. Local range extended into Isle of Wight County; swampy depressions in sandy pine barrens and open woods, south of Lee's Mill, no. 12,041. See p. 502.

Stenanthium gramineum (Ker.) Kunth. Sussex County: open woods along Nottoway River at Peters Bridge, nos. 12,043

and 12,295.

Far remote from its stations in Shenandoah and Highland Counties, recorded in Claytonia, i. no. 2: 13 (1934). See p. 499.

\*Allium Ampeloprasum L., var. atroviolaceum (Boiss.) Regel. York County: becoming very abundant, open roadside and fields south of Yorktown, no. 12,046; abundant near mouth of Indian Fields Creek, above Yorktown, no. 12,047.

Very handsome on account of its large globular dark purple inflorescences but likely to become a worse pest than A. vineale, the deep-seated bulbs bearing very numerous small bulblets which rapidly spread the plant. See p. 504.

A. CANADENSE L. HENRICO COUNTY: sphagnous bog bordering White Oak Swamp, west of Elko Station, no. 12,044. Sussex County: alluvial woods along Nottoway River at Readjuster Bridge, south of Peanut, no. 12,045. Greensville County: similar situation to last, north of Orion, no. 12,212.

Our first stations on the Coastal Plain of Virginia.

ERYTHRONIUM AMERICANUM Ker.

In a piece of rich woodland northwest of Emporia where in favorable conditions the flowers, borne 3 dm. above the bulb, had perianths 3.3 cm. long, individuals growing in thin sterile soil were only 1–1.5 dm. high and with perianths down to 1.8 cm. long. This variation was clearly due to increase or decrease of nutrition.

SMILAX HISPIDA Muhl. To the few recorded stations on the Coastal Plain add the following. Prince George County: thickets at upper border of beach of James River, Windmill Point, Flowerdew Hundred, no. 12,990. Sussex County: rich woods by Nottoway River, southeast of Stony Creek, no. 12,229; alluvial woods along Nottoway River at Readjuster Bridge, south of Peanut, no. 12,300. York County: rich wooded ravine by York River, above Yorktown, no. 12,048. See pp. 510 and 524.

DISCOREA BATATAS Dene. Henrico County: abundantly naturalized in border of rich woods near margin of a canal from

James River, Richmond, no. 12,304. See p. 510.

Iris Pseudacorus L. York County: swale by a small branch

near York River, above Yorktown, no. 12,051.

CLEISTES DIVARICATA (L.) Ames. To the small and scattered stations in adjoining counties add an equally meagre one in Isle of Wight County: moist sandy and peaty pine barrens south of Lee's Mill, no. 12,616. See p. 519.

Triphora trianthophora (Sw.) Rydb. Surry County: rich

calcareous wooded ravine west of Claremont, no. 12,617.

Our first station on the Coastal Plain of Virginia. See p. 520.

Calopogon Pallidus Chapm. Range extended north into Isle of Wight County: moist sandy and peaty pine barrens south of Lee's Mill, very scarce, no. 12,310. See pp. 502 and 508.

\*C. Pulchellus (Sw.) R. Br., forma albiflorus (Britton) Fernald. Nansemond County: sandy and peaty pine barrens northeast and east of Cox Landing, south of South Quay, no. 12,059; sphagnous savannah-like swale east of Cherry Grove, south of South Quay, no. 12,060, very abundant.

Ordinarily the albino form is rare and casual, but at the station of no. 12,060 it abounds, many scores of plants with their milk-white flowers making a striking display. See p. 502.

Malaxis floridana (Chapm.) Kuntze. To the few recorded stations add the following. Surry County: rich calcareous wooded ravine west of Claremont, plants scattered, rather scarce, no. 17,618. Isle of Wight County: border of cypress and gum swamp back of the beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), very scarce, no. 12,619. See pp. 520 and 525.

Hexalectris spicata (Walt.) Barnh. To the now several known stations add one of 20 or more plants in Sussex County.

See pp. 507 and 518.

\*Corylus americana Walt., var. missouriensis A. DC. Sussex County: rich woods along Nottoway River, east of Huske, nos. 12,330 and 12,331; rich woods by Nottoway River, above Readjuster Bridge, south of Peanut, no. 12,997. See p. 509.

\*X QUERCUS CADUCA Trelease (Q. cinerea × nigra). Nansemond County: a small tree in white sand of pine and oak woods and clearings near Cathole Landing, west of Factory Hill, no. 12,326. See p. 509.

\* $\times$  Q. Carolinensis Trelease (Q. cinerea  $\times$  marylandica). Isle of Wight County: tree 25 feet high, in dry sandy pine

barrens, south of Lee's Mill, no. 12,627. See p. 508.

\*X Q. LUDOVICIANA Sargent (Q. falcata × Phellos). Princess Anne County: large tree in clearing near landing, Ragged Island, no. 12,323. See p. 513.

\*Q. VIRGINIANA Mill., forma Macrophylla (Sargent) Trelease. Princess Anne County: abundant in low woods along Back Bay, Cedar Island, no. 12,325.

Trees with large leaves (1 dm. long, 4 cm. broad) as abundant as typical small-leaved Q. virginiana. See p. 513.

Ulmus fulva Michx. Extending down the James to Isle of

Wight County: (several nos.).

Aristolochia Serpentaria L., var. hastata (Nutt.) Duchartre (A. hastata Nutt.). Dinwiddie County: rich deciduous woods about old marl-pits east of Burgess Station, nos. 9914 and 10,248 (passing into typical A. Serpentaria). Southampton County: rich wooded slopes and spring-heads along Nottoway River, above Carey Bridge, no. 12,064; rich wooded ravines, slopes and clearings along Nottoway River, near Davis School, northwest of Courtland, no. 11,817.

In Gray's Man., ed. 7, and in Britton & Brown's Illustrated Flora, ed. 2, only tentatively included as extending north into Virginia.

\*Rumex altissimus Wood. Dinwiddie County: waste ground and cinders of freight-yard of Atlantic Coast Line, Petersburg, no. 12,065.

No specimens in Gray Herbarium from south of Maryland; cited in Trelease's Monograph as south only to the District of Columbia. See p. 493.

Chenopodium leptophyllum Nutt. To the station near Cape Henry add one (adventive) in Southampton County:

by railroad, Courtland, no. 12,069.

C. Boscianum Moq. Isle of Wight County: sandy beach of Burwell's Bay, James River, below Rushmere (Fergusson's Wharf), no. 12,645. Sussex County: disturbed spot at border of dry sandy hickory and oak woods near Chub, no. 12,644.

Our first specimens on the Coastal Plain. See p. 519.

Salsola Kali L. Extending up the James to Isle of Wight County: sandy beach of Burwell's Bay, below Rushmere (Fergusson's Wharf), no. 12,647.

Paronychia riparia Chapm. Range extended northeastward into Isle of Wight County: white sand of dry woods and

clearings east of Joyner's Bridge, no. 12,344.

CERASTIUM BRACHYPETALUM Desportes. To the first American station (south of Franklin), recorded in 1939, add another, also in Southampton County: roadside thicket, bordering dry sandy pine woods by Nottoway River, near Carey Bridge, no. 11,821.

\*SILENE CUCUBALUS Wibel. York County: sandy beach of York River and fields above Yorktown, no. 12,073. Henrico County: cinders of Chesapeake and Ohio Railroad, Elko Station, no. 12,072. See p. 505.

Extension south from Maryland and the District of Columbia.

\*S. Antirrhina L., forma Deaneana Fernald. York County:

open roadside banks south of Yorktown, no. 12,071.

\*Ceratophyllum echinatum Gray. Sussex County: in water at margin of Chappell's Millpond (Honey Pond), west of Lumberton, no. 12,346. Princess Anne County: West Branch Creek, west of Pungo, no. 10,642. See p. 508.

The study by Dr. W. C. Muenscher in Am. Journ. Bot. xxvii. 231–233 (1940) brings out the apparently constant relation of the fruit-characters to the foliage of seedlings in *C. echinatum* and the commoner and amphigean *C. demersum*. Study of all fruiting material in the Gray Herbarium shows that, in addition to the fruit-characters (which are seen in only 1 collection in 10 or 20), the two can be separated by mature foliage. In